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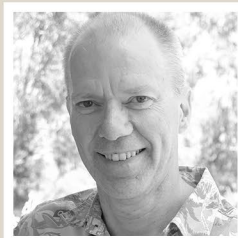
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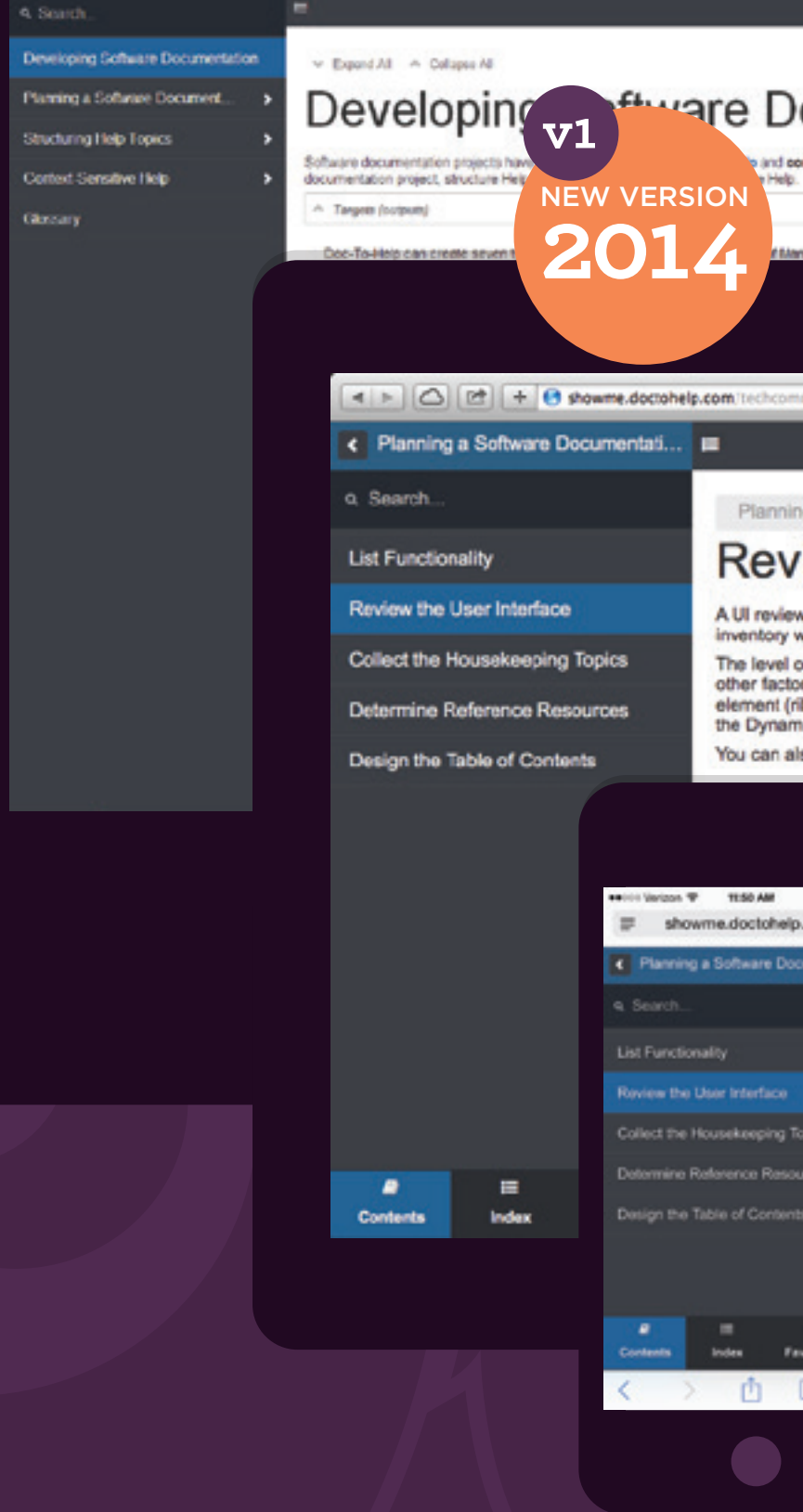
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Menno D.T. de Jong, Editor

Dealing with the Dynamics of Active Users

Knowledge of the users of technology—or, more correctly, a thorough understanding of the users of technology—is one of the competencies that distinguishes technical communicators from other professionals in the arena. This competency is vital for one of the core responsibilities of technical communicators, their role of user advocate. Frequent confrontations with real users struggling with technology, recurring processes of familiarizing themselves with new devices or new software applications, and the challenge of explaining technology to new users are activities that contribute to this competency.

The image of the users of technology has evolved from static to dynamic. Users are no longer assumed to always use devices and software exactly as intended by the designers. Instead, they make sense of technology in their own way and actively try to give technology a place in their daily routines. As such, they co-shape the technology they use in their lives. The research on the phenomenon of active users, however, seems to lag behind.

Active Users and User Instructions

The concept of active users is quite familiar in the context of user instructions. When I think of active users, the first thing that comes to mind is the way people work with user instructions. There still seems to be an official scenario, in which a user first reads the instructions

before he or she starts installing and using a device. Like the user manual of my all-in-one printer, scanner, and copying machine says: "Unpack and power on your printer (see setup flyer)." In reality there will be no user who has not done that before even looking for the manual. "Before using the user manual" is the first, and puzzling, heading of the user manual of my Blu-ray disc player, a sentence that seems to come from another planet. Despite decades of research, some manuals still seem to suggest that users will read them in a linear way before they start experimenting with the device or software.

Still every technical communicator is aware of the nonlinear way in which users work with user instructions. People who argue that hypertext thoroughly affected the way people read functional documents underestimate the nonlinear way in which people were already used to reading paper documents. We know that users read user instructions in a very efficient and goal-oriented (although not necessarily successful) way, minimizing the reading part and optimizing the navigating and scanning of text. We have come to accept that navigation is an important aspect of the usability of documents, so important that we sometimes seem to neglect the comprehensibility and applicability of the information in usability testing.

Active Users and Products

The notion of active users is not limited to their working with user instructions. Several theories underline that also the behaviors of users with devices and software reflect the disposition of active users. Traditional theories such as the Diffusion of Innovations Theory, the Technology Acceptance Model (TAM) and the Unified Theory of the Use and Acceptance of Technology (UTAUT) seem to suggest that users merely have the options to accept or reject a product. But there are other theoretical approaches that assume a much more active role of users.

The concept of appropriation underlines users' ability and inclination to actively shape technology. In their process of incorporating technology in their daily routines, some functions of products may be highlighted, and other functions remain largely unused. Users may even use devices or software for purposes that the designers never thought of, and thus co-invent new functionalities. Think of the selfies option on cell phones. With the earlier smartphones, without a front-facing cam, it was quite an achievement to take a good selfie (although some cell phone users appeared to be very skilled at that). Modern smartphones without a front-facing cam are not

imaginable. Understanding users includes developing insight in such appropriation processes. There are some studies into people's creative use of devices, but they remain rather conservative, with pre-defined creative uses instead of an exploratory design.

Appropriation can be defined as what people do with technology. The reverse process—what technology does with people—is equally relevant. This is called mediation. Understanding active users also implies gaining an understanding of how their lives are affected by technology. This may refer to overall effects of devices. Think of how the Internet or cell phones have changed our lives and our relationships with others. Think of how SPSS has changed academic research, or how word processors and content management systems have affected our writing. It may also refer to effects of small design characteristics, for instance in instant messaging tools. Recently, a fierce debate in the media started after Whatsapp added a feature that showed whether or not the receiver had read a message. The decision to include such a feature or not directly affects the way users communicate with each other. A thorough insight in the effects of technology on people is a prerequisite for a real understanding of users.

Implementation may be a third concept to consider. Implementation normally includes complex organizational systems and processes. Many implementation processes of software or devices fail or at the very least encounter serious problems. The compatibility of the new technology with existing work processes within an organization

is one of the critical factors. The influences of human preference, skills, and resistance are other factors. It is easy for good software packages to fail in organizational contexts.

Such insights in people's use of technology seem to call for an understanding of users beyond the limited context of usability testing, with pre-defined tasks and artificial contexts. Research could further explore the dynamics of appropriation, mediation, and implementation processes, and the extent to which technical communicators can use such knowledge in their work.

In This Issue

The first article in this issue, by Ryan Boettger, investigates the phenomenon of editing tests, which are commonly used by companies to assess the editing and writing skills of prospective technical communicators. Boettger analyzed the content of existing editing tests, and collected technical communication professionals' views on the errors included in them. He showed that organizational contexts and professional views lead to different perceptions. The frequency of problems included in tests did not correlate with the severity of the problems in the eyes of professionals. As such, the article provides food for thought about current practices and clues to further improve such tests.

In the second article, Pieter Cornelissen, Joris van Hoof, and Mark van Vuuren describe a quantitative study into the safety climate of and employees' safety performance within an organization. Of the variables

included in their study, personal motivation—employees' own motivation to behave safely—and external ability—the organization's ability to provide a safe workplace—appeared to affect safety climate and safety performance. The results give rise to reflections about the design of effective safety instructions, a topic that deserves more research attention within the domain of technical communication.

In the third article, Heidi Everett analyzes the instructions for Web design in popular textbooks from the mid-1990s to now. She is particularly interested in the nature of the instructions: Are they presented as clear-cut guidelines that simply have to be applied, or are the designers of Web sites encouraged to think critically about their usefulness and about the rationale behind them? She also reflects on the role of theory in the textbooks.

The fourth and last article, by David Magolis and Michael Homishak, focuses on users' perspectives on technology. Specifically, they investigate the attitudes of preservice teachers toward the use of technology in class, as well as their use of technology. Three main problem areas are identified: a lack of formal training in technology use, concerns about the effects PowerPoint may have on presentations—a familiar topic in earlier *Technical Communication* volumes—and the risk of an over reliance on technology.

This issue's Book Reviews section is complemented by a Tools of the Trade article in which Brenda Huettner describes and compares four books on infographics.

The Technical Communication Editing Test: Three Studies on This Assessment Type

Ryan K. Boettger

Abstract

Purpose: In this paper, I present the results of three studies on editing tests used to screen prospective technical communicators and the error types common to these tests. Because few publically available, authentic examples exist, I first explore the general characteristics of 55 tests and 71 error types. Error types are correlated against 176 professionals' perceptions of these error types.

Method: The sample's characteristics were first identified from the tests and the hiring managers. Three raters then independently classified the errors types using coding schemas from previous taxonomies of college-level writing. Finally, a 24-question survey was administered to capture professional communicators' perceptions of error.

Results: Editing tests were typically designed in narrative format and evaluated holistically, but variation in administration and format existed. The sample included 3,568 errors and 71 error types. Errors related to wrong words, spelling, and capitalization dominated, but 13 other errors were frequently found as well as dispersed within at least 50% of the sample. Conversely, professionals were bothered most by apostrophe errors, homonyms, and sentence fragments. No significant correlations were found among the frequencies and dispersions of the editing tests' errors and the professionals' perceptions of those errors.

Conclusions: Editing tests share common characteristics, but organizational context substantially influences its format and contents. There were consistencies between the editing test error types and types identified in college-writing taxonomies; however, context again influences why errors are introduced as well as the types of errors that were identified. Finally, hiring managers and professionals share different perceptions of error. Understanding these differences can produce better assessment tools and better prepare test takers.

Keywords: editing tests, error taxonomies, grammar, technical editing, usage

Practitioner's Takeaway

- The editing test is a privatized and highly contextualized assessment type. Practitioners need to understand where variation in format and content exists so they can better prepare for or create more effective tests.
- The weighted index of 71 error types provides the first empirically derived list of errors from a professional text. Practitioners can use this resource to prepare for an editing test or revise their in-house style guide. Academics can use this resource to extend research on editing and error as well as prepare the next generation of technical communicators.
- Hiring managers and professionals have different perspectives of errors. This knowledge might help move the discussion away from personal preferences to understanding why audiences in our field perceive and prioritize error differently.

Technical Communication Editing Test

Introduction

Editing tests assess the basic skills of prospective technical communicators. According to a 2003 article in *Intercom*, hiring managers typically construct these tests around three primary skill sets: (1) the test takers' ability to recognize obvious grammatical and mechanical errors; (2) their ability to recognize less obvious errors that could relate to organization and logic; and (3) their overall editing process, including how they solve problems and demonstrate good judgment (Hart, 2003). With the exception of this *Intercom* piece, little has been written about this assessment tool.

In this paper, I report the results of three studies that extend the assumptions of editing tests and the opinions of usage error. In the first study, I analyze the general characteristics of 55 authentic tests that managers use for hiring purposes. Results suggest typical conventions of tests as well as insights into how hiring managers prepare and evaluate these tests.

The second study focuses on the major content of editing tests—the error types related to grammar and mechanics, punctuation, spelling, content, style, and design. Usage error is a popular topic among technical communication practitioners and academics. However, the field also offers little empirical evidence of what the most predominant and prioritized errors are, or how these audiences think about error.

The third study reports how 176 technical communication professionals perceive error, specifically the errors that were frequently occurring and strongly dispersed within the editing test sample. Collectively, the results from these studies can benefit the hiring managers who create the tests, the practitioners who take the tests, and the academics who prepare the next generation of technical communicators.

I posed the following research questions to guide these inquiries:

RQ1: What are the general characteristics of editing tests? Specifically, how are the tests administered, what are the typical formats, and how is performance assessed?

RQ2: What are the general contents of editing tests? Specifically, which error types appear most frequently and how dispersed are these errors?

RQ3: How do practicing technical communicators' perceptions of error reflect the errors identified in the sample?

Study 1: Characteristics of Editing Tests

The editing test is a privatized genre, containing sensitive information that is circulated only within organizations or with important stakeholders. Technical communication includes a variety of privatized genres, including the proposal and the report for decision making (Johnson-Sheehan, 2008; Rude, 1995). The editing test's privatization also means few authentic examples are publically available. Textbooks include copyediting practice, and the Dow Jones News Fund releases an annual test in connection to its internship program, but these examples do not necessarily assess the skills specific to technical communicators (Bragdon, 1995; Rude & Eaton, 2011). Practitioners then are left to speculate about the contents, and new hiring managers have no model for building their company's tests. For the first study, I investigated the general characteristics of 55 authentic editing tests, including their administration, format, and evaluation. The results provide new information on these tests and insights into how managers make hiring decisions.

Methods

I obtained most of the editing tests by posting requests on Listservs (for example, the Society for Technical Communication's Technical Editing Special Interest Group, Copyediting-L). I also emailed the human resources representatives of organizations that posted technical editor or writer positions on job search engines (for example, STC job bank, Monster). I signed a nondisclosure agreement with a majority of the companies to protect the integrity of the test.

I coded the 55 editing tests on a number of content variables related to administration, format, and assessment. The actual tests included most of this information. Almost 80% of the sample's hiring managers also volunteered insights into how they assessed the test as well as their justifications for their test's design and contents.

Results

The editing tests represented companies in 21 states and nine industries; they were all used to evaluate

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prospective technical communicators. Forty percent of the sample were from either Texas-based (22%) or California-based (18%) companies. This result reflects data reported in STC's most recent salary survey (2013), which indicated companies in these two states employed the most technical writers. Hiring managers from 19 other states contributed to this study's sample, with the next highest number of tests coming from Maryland-based companies (9%).

The industries of the participating companies were broadly classified within the North American Industrial Classification System. Over 60% of the sample were classified as Professional, Scientific, and Technical Services (35%) or Information (26%). The remaining industries included Manufacturing (11%); Educational Service (9%); Transportation and Warehousing; Utilities; Health Care and Social Assistance (5% each); Federal, State, and Local Government; and Arts Entertainment and Recreation (2% each).

Administration. Hiring managers indicated no preference in testing site or administration method. Fifty-one percent of tests were administered on-site and 49% off-site. Similarly, 55% of the tests were taken on a computer and 45% on paper. Not surprisingly, 93% of the off-site tests were computer-based, and 89% of the on-site tests were paper-based.

Hiring managers indicated they used computer or paper testing more for their convenience than a means for assessing a particular skill, such as an applicant's knowledge of copyediting marks. "All the markup in my department is on PDF," wrote a hiring manager. "I don't care whether applicants use standard markup symbols. I do expect the markup be comprehensible though." Another hiring manager added she and her hiring team do not discredit applicants for incorrect copyediting marks. "If they legibly and correctly indicate an error or suggest a revision, we count it as correct." For the computer-based tests, all applicants were instructed to use "Track Changes" tool in MS-Word.

Twenty-two percent of applicants were given unlimited time to complete their test. Of the remaining tests, applicants had about 46 minutes to complete the paper tests (sd = 31.43, median = 30) and about 4,227 minutes (approximately three days) to complete the electronic tests (sd = 12867.12, median = 180).

Hiring managers cited a variety of reasons for time limits. Two hiring managers said they observed how applicants work within the designated deadline. One

hiring manager gives her applicants only 15 minutes for the test to gauge how quickly applicants can diagnose the major issues with the document. "You'd be surprised at the results," she said. "The issues applicants identify often tell me more about their knowledge gaps than strengths." While neither expected applicants to be content experts, they expected them to query the author about that content in a reasonable period of time. A third hiring manager built 10 additional minutes into her testing time to encourage applicants to ask questions and query the author. She also does not inform applicants when they exceed the test's 30-minute time limit, a data point she records and considers in her hiring decision. However, time limits can also hinder the number of edits applicants can make. Several managers provided unlimited time to assess for over-editing, their mark of a poor editor or time manager.

Format. Sixty-seven percent of the tests were written in narrative format. On average, these sections were 1,141 words in length (sd = 1826.97, median = 528). Eleven percent of the tests were in sentence format. On average, these tests contained 18 sentences (sd = 7.12, median = 18). Seven percent of the tests were multiple choice. On average, these tests included 48 sentences/questions (sd = 47.64, median = 20). The remaining 15% of the sample included a combination of narrative, sentence, multiple choice, and true/false formats. Only 34% of tests required applicants to edit a technical table or an instructional graphic.

All of the narrative tests included copy from a live document previously used by the company. The hiring managers reported using a narrative format because it was more open-ended. Indeed, narrative tests are more subjective and therefore give applicants options for correcting an issue. In contrast, the sentence and multiple choice tests were more prescriptive by design (with only one correct edit) and focused on assessing rudimentary knowledge of grammar, punctuation, and spelling.

Finally, 70% of the tests required applicants to demonstrate knowledge of one of five style guides including the *Chicago Manual of Style* (35%), the *American Medical Association Manual of Style* (15%), the *Microsoft Manual of Style* (9%), the *Associated Press Stylebook and Briefing on Media Law* (3%), and the *American Psychological Association Style* (1%). Otherwise, several tests included style sheets for applicants (7%) or instructed them to use the style guide of their choice (7%).

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Assessment. The majority of hiring managers assessed their tests holistically (64%) rather than assigning a point for every issue correctly addressed (31%) or a combination of these approaches (5%).

According to the hiring managers, holistic assessment allowed them to gauge which errors the applicant fixed in relation to the ones they missed. "I am always surprised at the things that are missed," wrote a hiring manager. "Sometimes applicants focus on rewriting sentences and miss the basics like not spelling out *percent*." Holistic assessment also allowed hiring managers to evaluate comprehensive rather than just copyediting skills. Another hiring manager designed her test to be rewritten rather than simply copyedited: "If an applicant just marks incorrect grammar and catches font changes, he won't be the writer we need." When evaluating the test, she looks for this awareness and how well applicants demonstrated their understanding to the test's subject matter, saying, "If they don't get the gist of the procedure, then they won't be able to do the work we need here."

Assessment instruments varied across companies. Ninety-three percent of the hiring managers supplied me a key to their test (suggesting a more objective assessment) but then acknowledged the key functioned more as a guide, and they already had an idea of the issues they wanted applicants to address. This suggests issues that could impact the actual assessment of these tests, including evaluation disparities across multiple raters who might value certain errors over others.

Over 30% of hiring managers assessed their tests objectively or point-based, citing standardization in hiring procedures as the reason. One hiring manager used a five-point scale to evaluate "Big Picture" and "Details," his terminology for macro- and micro-level editing. "Big Picture" skills included how well the applicants understand the content, if they distinguished between steps and explanations, used you-inclusive language, and queried the author on specific issues. "Details" measured if applicants eliminated jargon or wordiness as well as integrated and maintained consistency in the document, such as step numbering, typefaces, and the punctuation of compound words.

Collectively, the hiring managers continue to administer their test because they assess the skills needed to work at their organization. Many acknowledged that some applicants feel insulted for having to take an editing test but stated their tests evaluate a host of skills and behaviors, some of which applicants are never aware are being tested. "Periodically we have arguments on the STC manager's listserv as to whether writing/editing tests are worthwhile," wrote a hiring manager. "Personally, I think they can show a great deal: how you work under pressure, how you actually write on your own, and the breadth of your skills." A vital part of being successful on editing tests though is recognizing and fixing a variety of usage errors. The second study focuses on these error types.

Study 2: Error Types in Editing Tests

Usage error remains a popular topic among technical communicators. To prepare her newsletter article on "The Top Ten Errors That Technical Communicators Make," Wenger (2010, September 13) solicited input through the STCTESIG-L, eliciting a variety of responses, including the correct use and punctuation of restrictive and nonrestrictive clauses and the ungrammatical use of *for example*. To date, these types of anecdotal discussions remain the best source of information on error for technical communicators.

The best information our field has on error are the results from two empirical studies on the prominent errors in college writing (Connors & Lunsford, 1988; Lunsford & Lunsford, 2008). Connor and Lunsford's 1988 study interrogated the most common patterns of college student writing errors and the corresponding frequency of error markings by teachers. This study resulted in a published list of over 50 formal and mechanical errors college students made in their writing where misspellings outnumbered the other errors by 300% and were removed from the formal study for independent analysis (Connors & Lunsford, 1992). Connors and Lunsford ranked the remaining errors by frequency, selecting the top 20 for further inquiry. The list began with "Missing comma after an introductory element" (occurring 11.5% of the time) and ended with "Its/it's error" (occurring 1.0% of the time). Twenty years later, Lunsford and Lunsford (2008) followed up this study. The updated results reflected how a broader use of academic genres and the expansion of technology changed the error patterns in college writing. Due to an increase in argument papers, the new list included errors related to using sources, quotations, and attributions. Technology also played a role in the rank of specific errors. "Misspellings" now ranked fifth, and "Wrong

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word" emerged as the top error. Lunsford and Lunsford attributed these shifts to electronic spellcheckers; the technology helps students remedy misspellings, but a reliance on the automated spelling suggestions likely correlates to the increase in wrong words.

The Connors and Lunsford and Lunsford and Lunsford taxonomies offer the most thorough research on usage error, but these results reflect the error patterns of developing writers rather than the patterns of expert, professional communicators. Additionally, the results do not necessarily reflect the context of the editing test situation where applicants are under time constraints or the contexts of professional writing where error types related to style and content could play a more prominent role than in academic writing. Further, the rank and pattern shifts found in these studies suggest the importance of studying error in relation to context. Haswell (1988) stressed errors were best understood within their context: "When context is neglected, as in much research into the relation of error and change in writing, conclusions are often difficult to interpret, sometimes even outright misleading" (p. 482). For example, simply reporting the raw frequencies of errors committed in a writing sample motivates little useful discussion if these mistakes are not contextualized. My second study scaffolds from Connors and Lunsford to examine the patterns and perceptions of error in technical communication, a, thus far, neglected field in error study. I identified the types, frequencies, and dispersions of errors within the sample from the first study. Editing tests are unique because they purposely contain errors; therefore, this study operated under the hypothesis that the more frequent and dispersed the error, the more important its identification is to hiring managers.

Methods

Two raters independently classified the errors in each test. Ninety-three percent of the hiring managers provided keys for their tests, which ensured these errors were classified by the company's perspective. Both raters were pursuing master's degrees in technical communication and had successfully completed graduate-level courses in editing and style. When possible, errors were identified by the types/pattern used in Connors and Lunsford and Lunsford and Lunsford; however, multiple new errors related to style, content, and design were found in this sample. Errors were also classified into one of six broad categories:

grammar and mechanics, punctuation, spelling, style, content, and design.

A third rater was consulted in instances where a test had no key. Four of these tests were from medical fields, and the rater had over a decade of medical editing experience. Percent or pairwise agreement between the raters identified an 81% consensus level, an acceptable level of agreement (Frey, Botan, & Kreps, 2000; Watt & van den Burg, 1995).

Measures. I examined the sample through two measures. Results from the contingency table analysis revealed how evenly distributed the errors were across the six broad categories. Only one previous study broadly grouped errors to measure their distribution (Boettger, 2012); therefore, the null hypothesis assumed that if the errors were evenly distributed, each category would contain 594.67 errors. I determined this number by dividing the total number of errors (n = 3,568) by the total number of categories (n = 6).

I also report what I hereafter refer to as an error's weighted index. The weighted index factored the frequency and the dispersion of each error into a single numerical value. While a lone frequency list provides useful information on the frequency (or popularity) of errors, it cannot account for errors that cluster in a small number of the sample (that is, weakly dispersed errors) compared to errors that appear consistently throughout the sample (that is, highly dispersed errors). The index weighted each error's frequency and dispersion 50/50 because I could not identify an existing model that suggested a different weighting. I provide more explanation of both measures in the results section.

Results

There were 3,568 errors and 71 error types in the sample. Each test contained an average of 66.46 errors (median = 69.5, sd = 37.48) and an average of 23.38 different error types (median = 26.0, sd = 9.90).

Contingency Table Analysis of Errors by Category. The contingency table analysis determined if the errors were evenly distributed across six broad categories. Table 1 presents these categories by their observed frequencies. Grammatical and mechanical, style, and punctuation errors all appeared in the sample at a higher than expected frequency (that is, > 594.67 errors); but content, spelling, and design errors appeared at a lower than expected frequency. None of the errors were distributed as expected.

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Table 1. Broad Error Categories, Their Frequencies, and Significance Levels of the Contingency Table Analysis

Broad error category	Frequency	$P_{binomial}$
Grammar and mechanics	856	0.00
Style	840	0.00
Punctuation	675	0.00
Content	495	0.00
Spelling	439	0.00
Design	200	0.00

Weighted Index (Frequency and Dispersion) of Errors by Type. The weighted index factored how frequent and dispersed each error was within the sample. Table 2 lists the sample's top 16 errors, which were dispersed in at least 50% of the tests. These errors made up 57% of the total errors in the sample.

As described in the methods section, the index weighted each error's frequency and dispersion 50/50. The approach reveals subtle but important results a lone frequency list could not. For example, "Misplaced/dangling modifier" was the 14th most frequent error,

found 75 times and comprising 2% of the errors in the sample. This error's frequency index of 0.02 was determined by dividing 75/3,568, or the total number of errors. However, this error was also the fourth most dispersed error, found in 37 tests. This error's dispersion weight of 0.67 was determined by dividing 37/55, or the total number of tests in the sample. An average of these two scores (0.02 + 0.67/2) produced this error's moderate frequency and strong dispersion, yielding the weighted index score of 0.35 and the rank as the fourth most predominant error.

Typically, an error's frequency and its dispersion strongly correlated as visualized in Figure 1. However, errors like "Lack of subjective-verb agreement" and "Missing comma in a series" secured higher ranks because of their strong dispersions, an indication these errors were commonly found in the tests but in comparatively lower frequencies. Figure 1 also illustrates the three errors that dominated this sample: "Wrong Word" (broadly categorized as a content error), "Misspelling" (spelling), and "Unnecessary or missing capitalization" (grammar and mechanics). Collectively, these errors accounted for almost a quarter of the

Table 2. Sixteen Most Predominant Errors Ranked by Their Weighted Index

#	Error	Broad error category	Frequency index	Dispersion index	Weighted index
1	Wrong word	Content	0.05	0.96	0.51
2	Misspelling	Spelling	0.12	0.87	0.50
3	Unnecessary or missing capitalization	Grammar	0.06	0.75	0.40
4	Redundant, expendable, or incomparable language	Style	0.04	0.65	0.35
4	Misplaced/dangling modifier	Grammar	0.02	0.67	0.35
6	Hyphen, en- or em-dash errors	Punctuation	0.04	0.64	0.34
7	Incorrect number format	Style	0.03	0.58	0.31
7	Unnecessary shift in verb tense	Grammar	0.03	0.58	0.31
9	Lack of subjective-verb agreement	Grammar	0.02	0.58	0.30
9	Missing or wrong article	Grammar	0.02	0.58	0.30
9	Faulty parallel structure	Style	0.02	0.58	0.30
9	Missing comma with a nonrestrictive element	Punctuation	0.02	0.58	0.30
13	Unnecessary or missing apostrophe (including its/it's)	Punctuation	0.02	0.55	0.28
14	Incorrect singular/plural application	Grammar	0.02	0.53	0.27
14	Inconsistent terminology	Content	0.02	0.51	0.27
16	Missing comma in a series	Punctuation	0.01	0.51	0.26

sample's errors and were also strongly dispersed. The following section further analyzes these error types.
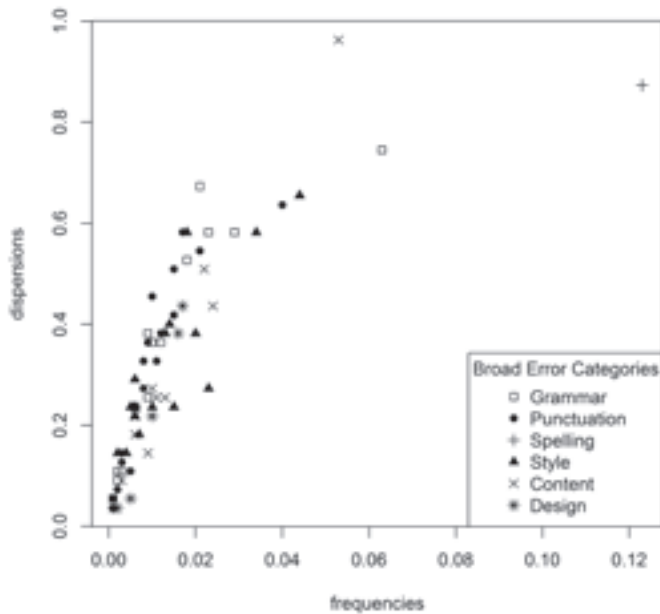
Figure 1. Scatter Plot of Errors by Their Frequencies and Dispersions

Wrong word. There were 190 wrong word errors, which consisted of 38% of the sample's content errors (Table 1). These errors included words that were incorrectly used like prepositions, words that sounded alike, or words with similar shades of meaning. Editors might have difficulty identifying these errors because they are not detectable with electronic spellcheckers as illustrated in examples [1-2].

[1] The subcontracting was distributed between three firms (Alred, Brusaw, & Oliu, 2012).

[2] I did not realize that half the accounting staff had a severe allegory to peanuts (modified from Lunsford, Matsuda, & Tardy, 2013).

Further analysis indicated incorrect preposition use substantially affected the weighted rank of "Wrong Word." Raters identified 63 instances of incorrect prepositions, elevating "Wrong Word" from the fifth to the most dominant error.

Misspelling. Raters identified 439 errors related to spelling (Table 1). These errors were subdivided into five mutually exclusive categories: general, homonym,

proper noun, compound, and British. Over 50% of the misspellings were classified as general, or misspellings that could be detected by an electronic spellchecker ([3], see Table 3).

[3] A former employee was charged with sexual harassment in an *embarassing* and costly lawsuit.

Table 3. Spelling Errors Classified by Broad Categories

Categories	Frequency
General	223
Homonym	72
Proper	62
Compound	57
British	25

British spellings comprised only 5% of the sample, but, when grouped with general, misspellings that could be detected by a spellchecker accounted for 56.5% of the sample. This insight is interesting when considering hiring managers administered 49% of the tests off-site where applicants could activate their electronic spellcheckers. The remainder of the "Misspelling" category (43.4%) included spelling errors that required additional knowledge or research to fix [4-5].

[4] During the meeting, she sited data from the latest research study (Gurack & Hocks, 2009).

[5] Since 1976, National Instrument has equipped engineers and scientists with tools that accelerate productivity, innovation, and discovery.

The proper noun errors in the tests reflected some of the hiring managers' observations from the first study about their tests not always assessing what applicants assumed is being assessed. For example, one of the editing tests included a style sheet that spelled four proper nouns in bold print with the instructions that "everything in boldface is correct." This device illustrates a technique to editing consistently and the ability to follow instructions. Additionally, over a dozen of the tests included a misspelling of that particular company's name (as recreated in [5]). These hiring managers included this error to assess attention to detail and measure the applicant's familiarity with the organization.

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Unnecessary or missing capitalization. There were 226 errors related to capitalization, which consisted of 26% of the sample's grammatical and mechanical errors (Table 1). These errors overwhelmingly related to the capitalization guidelines outlined in style guides, including capitalizing titles of words, organisms and pathogens, viruses, tests, and sociocultural designations as well as the de-capitalization of common words derived from proper nouns (for example, parkinsonism).

Fifty-five additional errors were identified in the sample. These errors were all dispersed in 49% or less of the sample and collectively made up 43.5% of the total errors. As shown in Table 4, many of these errors

Table 4. Fifty-Five Additional Errors Ranked by Their Weighted Index

#	Error	Broad error category	Frequency index	Dispersion index	Weighted index
17	Missing comma after an introductory element	Punctuation	0.01	0.45	0.23
17	Vague or missing language	Content	0.02	0.44	0.23
17	Space missing or needed	Design	0.02	0.44	0.23
20	Comma splice	Punctuation	0.01	0.42	0.22
21	Unnecessary passive construction	Style	0.01	0.40	0.21
22	Informal or discriminatory language	Style	0.02	0.38	0.20
22	Incorrect text styling	Design	0.02	0.38	0.20
22	Error with acronym or abbreviation format	Style	0.01	0.38	0.20
22	Incorrect or missing semicolon	Punctuation	0.01	0.38	0.20
22	Unnecessary comma with a restrictive phrase	Grammar	0.01	0.38	0.20
27	Fused (run-on) sentence	Grammar	0.01	0.36	0.19
27	Sentence fragment	Grammar	0.01	0.36	0.19
27	Incorrect or missing period	Punctuation	0.01	0.36	0.19
30	Unnecessary comma	Punctuation	0.01	0.33	0.17
30	Missing comma in a compound sentence	Punctuation	0.01	0.33	0.17
32	Faulty predication	Style	0.01	0.29	0.15
32	Error with citation format	Style	0.02	0.27	0.15
34	Lack of an organizational element	Content	0.01	0.27	0.14
34	Missing comma in a complex sentence	Punctuation	0.01	0.27	0.14
34	Incorrect or missing colon	Punctuation	0.01	0.27	0.14
37	Factual error	Content	0.01	0.25	0.13
37	Logic/sequence error	Content	0.01	0.25	0.13
37	Incorrect or missing pronoun	Grammar	0.01	0.25	0.13
37	Error with quotation format	Style	0.02	0.24	0.13
41	Fancy tone/language	Style	0.01	0.24	0.12
41	Emphasis error	Grammar	0.01	0.24	0.12
41	Lack of pronoun-antecedent agreement	Grammar	0.01	0.24	0.12
41	Vague pronoun or antecedent reference	Style	0.01	0.24	0.12

shared identical weighted ranks, a result of their lower frequency and weaker dispersion.

Despite their position, the presence of these error types merits reporting. For example, the seven errors broadly categorized as design all ranked low, but their inclusion is significant as design errors were not identified in the previously discussed error taxonomies.

This may indicate differences in academic and professional writing.

Some errors that ranked prominently in previous studies ranked lower in this sample. "Missing comma after an introductory element" was the 31st most frequent error and only moderately dispersed, accounting for its placement in the weighted index.

Table 4. Fifty-Five Additional Errors Ranked by Their Weighted Index (Continued)

#	Error	Broad error category	Frequency index	Dispersion index	Weighted index
41	Incorrect alignment	Design	0.01	0.24	0.12
41	Nominalization	Style	0.01	0.24	0.12
47	Incorrect font size	Design	0.01	0.22	0.11
47	Vague or missing title for content section or graphic	Content	0.01	0.22	0.11
47	Lack of imperative mood	Style	0.01	0.22	0.11
47	Restrictive should be nonrestrictive (vice versa)	Style	0.01	0.22	0.11
51	Incorrect title of works format	Style	0.01	0.18	0.09
51	Missing or incorrect in-text reference to table or figure	Content	0.01	0.18	0.09
53	Equation error	Content	0.01	0.15	0.08
54	Lack of "you-attitude"	Style	0.00	0.15	0.07
54	Missing comma in a parenthetical/transitional expression	Punctuation	0.00	0.15	0.07
54	Unnecessary negative construction	Style	0.00	0.15	0.07
57	Missing comma with paired adjectives	Punctuation	0.00	0.13	0.06
57	Missing parenthesis	Punctuation	0.00	0.11	0.06
57	Adjectival for adverbial form — "ly"	Grammar	0.00	0.11	0.06
57	Extra letter or word	Grammar	0.00	0.11	0.06
57	Missing word	Grammar	0.00	0.11	0.06
62	Poorly integrated of source material	Content	0.00	0.09	0.05
62	Missing conjunction	Grammar	0.00	0.09	0.05
64	Unnecessary ellipses	Punctuation	0.00	0.07	0.04
65	Incorrect font color	Design	0.00	0.05	0.03
65	Incorrect punctuation of a foreign word	Punctuation	0.00	0.05	0.03
65	Sentence ends with preposition	Grammar	0.00	0.05	0.03
65	Unnecessary exclamation	Punctuation	0.00	0.05	0.03
69	Incorrect pagination	Design	0.00	0.04	0.02
69	Indentation error	Design	0.00	0.04	0.02
69	Incorrect of missing question mark	Punctuation	0.00	0.04	0.02

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In taxonomies of college writing, this error ranked first or second (Connors & Lunsford, 1988; Lunsford & Lunsford, 2008). Interestingly, both studies also indicated teachers marked this error on students' papers with less frequency than other errors like incorrect uses of its/it's or possessive apostrophes. It could be hypothesized then that though college students frequently made this error, teachers did not consider its absence with the same weight as other, perhaps more glaring, errors. These results indicate that teachers often mark errors in terms of their relationship to a complex context. Since the present study identified its errors primarily from company-provided answer keys, the insignificant rank of "Missing comma after an introductory element" might also reflect hiring managers' opinion on this error in relation to wrong words, misspellings, and capitalization errors.

Finally, the errors that did not rank in the top 16 list are arguably more subjective and invite discussion regarding their inclusion in editing tests. For example, "Unnecessary passive construction" appeared on this list because the raters identified the pattern from the company-provided answer keys. Humanities-based fields generally discourage passive voice; however, previous language studies have identified that scientists and engineers use passive purposefully because the subject of their sentences are frequently mechanisms instead of people (Boettger, 2012; Conrad, 1996; Ding, 2001; Wolfe, 2009). Similarly, ending a sentence with a preposition might indicate an awkward sentence, but it is not necessarily an error. The inclusion of these more subjective types is noteworthy because they suggest how individuals—in this case, technical communication hiring managers—define correctness and perceive error. The third study extends this idea by correlating how professionals perceive error in relation to the errors in the editing tests.

Study 3: Professionals' Perceptions of Error Types

The majority of error research in technical communication emphasizes professionals' opinions of error rather than the errors found in authentic professional writing (Beason, 2001; Gilsdorf & Leonard, 2001; Hairston, 1987; Leonard & Gilsdorf, 1990). In one of these earlier studies, Hairston (1987) recorded practitioners' botheration level to specific usage errors.

The practitioners represented 63 occupations and were considerably bothered by errors classified as status markers: for example, "When Mitchell moved, he brung his secretary with him" (p. 796). The next tier of bothersome errors was grouped by mechanical mistakes—sentence fragments, fused sentences, and faulty parallelism. Two follow-up studies yielded similar results (Gilsdorf & Leonard, 2001; Leonard & Gilsdorf, 1990): fused sentences, faulty parallel structure, sentence fragments, and danglers ranked as some of the most distracting errors. While these studies generated important findings, the generalizability of the data is somewhat limited by methodological design. All of these studies solicited data via a questionnaire, including errors the researchers believed could be the most bothersome to practitioners. These results may not accurately reflect the errors practitioners prioritize over others. Similarly, data collected from questionnaires depend on self-reporting, which can motivate participants to respond in ways they think are appropriate to the research (Frey et al., 2000).

For the third study, I also surveyed how technical communication professionals perceived usage error. However, the errors measured here were identified in the editing tests. I then correlated these results with the weighted ranks of the errors in the second study.

Methods

For the survey, 176 participants registered their opinion on 24 different errors on a 7-point Likert scale.

The 24 errors were identified from the results of the second study. All six of the broad error categories (Table 1) were represented by 4 questions that included the two highest ranked errors, the median error, or the lowest ranked error. This approach provided a more representative sample of each category and extended previous studies where researchers selected errors based on how they believed respondents would react.

All 24 questions were in sentence format and included one error. The questions included error examples I took directly or modified from the earlier-cited surveys, technical editing textbooks, or technical writing handbooks. The examples in these texts presumably offered the best illustration of the particular errors.

I designed the survey using Qualtrics software, an approach that addressed some validity threats from similar studies. I selected two different sentences for each

error, one of which was randomly shown to participants. For example, participants recorded their reaction to sentence fragments after seeing either [5] or [6]:

[5] The staff wants additional benefits. For example, the use of company cars (Alred et al., 2012).

[6] Two years ago, a similar study was done by members of the accounting department. However, this study was negated. Because it was based on outdated estimates of the costs involved (Beason, 2001).

This approach helped ensure participants were responding to the error in the sentence and not just a poor or confusing sentence. Additionally, all 24 questions were randomized, so no two participants responded to the same questions in the same order.

The requests for participation were emailed to the same Listservs I used to collect the editing tests, including the STC's Technical Editing SIG-L, Copyediting-L. I targeted participants who played a role in hiring technical communicators. Participants were then instructed to respond to each error as if they were evaluating the writing of a prospective applicant for a technical communication position. One hundred and seventy six professionals responded to the survey. The response rate was 10.5%, which was determined by averaging the number of subscribers from the Listservs, though it is likely some participants belonged to both. For at least the last 20 years, the public has become saturated with surveys, yielding low response rates and making it difficult to generalize those results (MacNealy, 1992). Surveys conducted in our own field, such as the STC's Annual Salary Survey, have also typically had low response rates (Eaton, Brewer, Portewig, & Davidson, 2008b). Results from this survey cannot generalize how all technical communication professionals perceive error, but they provide a perspective on this topic from 176 respondents, a greater body of knowledge than previously.

Measures. I explored the results via descriptive statistics. Additionally, I correlated the survey results with the frequency and dispersion results from the editing test sample using a Spearman's rho test. Spearman's rho is a distribution-free, non-parametric correlation test; it is an alternative to Pearson and can be applied to two continuous variables (Baayen, 2008).

Results

Participants were moderately bothered by content errors, including wrong words, vague or missing language, poorly integrated source material, or logic/sequence errors (M = 5.04, sd = 0.36, see Table 5). As a contrast, results from the binominal test indicated content errors appeared in the editing tests at a lower than expected frequency (Table 1). Survey participants were also collectively neutral toward or had no opinion of the error types from the five other broad categories. Issues with grammar and mechanics ranked as the most bothersome in this scale (M = 4.74, sd = 0.60), and style errors ranked as the least bothersome (M = 4.30, sd = 0.69).

Table 5. Means (and Standard Deviations) of Errors by Broad Category

Category	M (sd)
Content	5.04 (0.36)
Grammar and Mechanics	4.74 (0.60)
Punctuation	4.72 (0.95)
Design	4.63 (0.56)
Spelling	4.52 (0.93)
Style	4.30 (0.69)

When analyzed individually, three tiers of bothersome errors emerged: errors participants were moderately bothered by, neutral toward, or somewhat bothered by (see Table 6). The moderately bothersome tier consisted of nine errors that represented all the broad categories. Participants were typically most bothered by "Unnecessary or missing apostrophe (including its/it's)" (M = 5.77, sd = 1.42).

Survey questions related to misspellings were organized into the same subcategories described in the second study (Table 3). Homonym errors were the only spelling type to rank in the moderately bothersome tier (M = 5.73, sd = 1.48). In contrast, homonym errors made up only 16% of the spelling errors in the editing tests, though "Misspelling" held an overall predominant rank on the weighted index.

Finally, three errors broadly classified as content appeared in the moderately bothersome tier, including "Logic/sequence error" [7], "Poorly integrated source material" [8], and "Wrong word [1-2]. "Wrong Word" was one of the most predominant errors in the editing tests; however, the others were both lower frequency/ weaker dispersed errors.

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Table 6. Most Bothersome Errors by Mean and Broad Error Category

Error	M (sd)	Broad error category
Moderately bothersome tier		
Unnecessary or missing apostrophe (including its/it's)	5.77 (1.42)	Punctuation
Misspelling (homonym)	5.73 (1.48)	Spelling
Sentence fragment	5.60 (1.62)	Grammar
Logic/sequence error	5.41 (1.72)	Content
Space missing or needed	5.35 (1.51)	Design
Fancy tone/language	5.33 (1.80)	Style
Incorrect or missing question mark	5.15 (1.83)	Punctuation
Poorly integrated source material	5.11 (1.81)	Content
Wrong word	5.10 (1.84)	Content
Neutral/no opinion tier		
Indentation error	4.78 (1.71)	Design
Misspelling (general)	4.75 (1.88)	Spelling
Unnecessary shift in verb tense	4.71 (1.81)	Grammar
Vague or missing language	4.55 (2.12)	Content
Unnecessary or missing capitalization	4.43 (2.03)	Grammar
Missing comma after an introductory element	4.34 (1.78)	Punctuation
Incorrect alignment	4.32 (2.53)	Design
Sentence ends with a preposition	4.25 (2.28)	Grammar
Incorrect text styling	4.07 (1.81)	Design
Incorrect number format	4.01 (1.80)	Style
Slightly bothersome tier		
Unnecessary negative construction	3.96 (1.94)	Style
Misspelling (proper nouns)	3.90 (2.39)	Spelling
Redundant, expendable, or incomparable language	3.89 (1.85)	Style
Misspelling (British)	3.69 (1.82)	Spelling
Hyphen, em-, and en-dash	3.61 (1.87)	Punctuation

[7] A 1970s study of what makes food appetizing "Once it became apparent that the steak was actually blue and the fries were green," some people became ill (Lunsford et al., 2013).

[8] We examined three storage methods most frequently used in our industry: (1) Trax, (2) Stacker, (3) Wide-Aisle Racking, and (4) Floor Storage (modified from Beason, 2001).

The neutral/no opinion tier included 10 errors. Errors from all six broad categories were also represented, including three errors related to grammar and mechanics. One of these errors was "Unnecessary or missing capitalization," which was a predominant error in the editing test sample. Both survey sentences on capitalization [9-10] received comparable means (M = 4.43 and 4.39, respectively), suggesting professionals did not respond to either example in drastically different ways.

[9] Visitors Must Register All Cameras with the Attendant at the Entry Station (Rude & Eaton, 2011).

[10] The principle agency involved is the department of agriculture; however, the budget bureau is also peripherally concerned (modified from Rew, 1999).

The somewhat bothersome tier included five errors and represented the broad error categories of spelling, style, and punctuation. In contrast, both "Redundant, expendable, or incomparable language" and "Hyphen, en- or em-dash errors" were predominant errors in the editing tests and also the highest ranked errors in their respective broad category.

Finally, I performed a series of Spearman's rho correlations on the frequency and dispersion data from the editing test sample and the survey data. As illustrated by Figure 2, overall error frequencies and dispersions significantly correlated (S = 47.18, p = 0.00). However, there was no correlation between overall error frequencies and perceptions (S = 1808.70, p = 0.45) or between error dispersions and perceptions (S = 1867.43, p = 0.35). This suggests that the weighted ranks of the editing test errors did not correlate with the professionals' perceptions of these same errors. This dichotomy suggests further discussion among technical communication hiring managers, practitioners, and academics.

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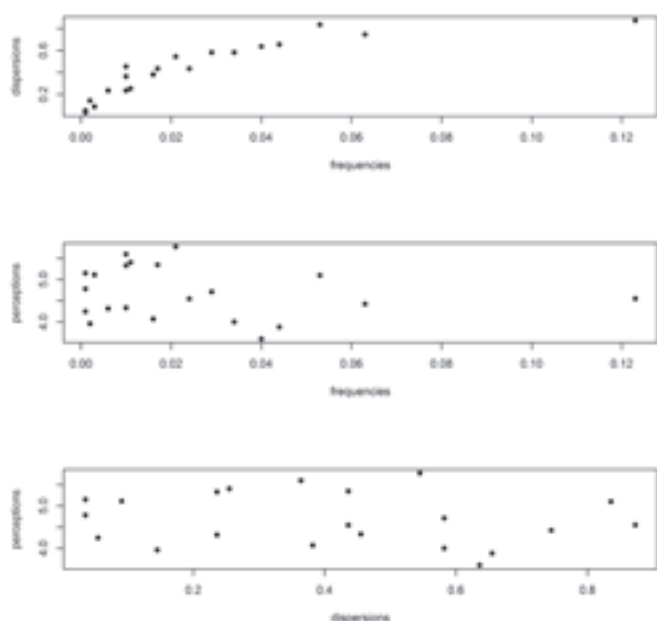
Figure 2. Scatterplots of Frequency, Dispersion, and Perceptions Data

Discussion

I conducted three studies using 55 editing tests and the results from a related survey on error perception. The first study investigated the general characteristics of the editing test, which I classified as a privatized genre. The sample shared some common conventions, but other conventions were tailored to each organization's assessment needs. The second study investigated the specific error types within the sample. A weighted index of frequency and dispersion identified 16 predominant errors that accounted for 57% of the sample's total errors. I used these results to construct a survey for the third study that measured technical communication professionals' perceptions of usage error. Results indicated that the frequency and the dispersion of the errors in the editing tests did not correlate with professionals' perceptions. Collectively, these results offer valuable information on how editing tests are constructed, which types of common errors are included in these tests, and how our perceptions of error might influence how we prepare for or construct these tests.

The most meaningful finding from the first study was the variations among the tests. Hiring managers typically created tests in narrative form (as opposed to multiple-choice or sentence), required applicants to demonstrate style guide knowledge, and evaluated the test with a holistic rather than a point-based approach. However, there were strong variations (indicated by the standard deviations) in other characteristics, including the time allotted to complete the test and the length of the test. These variations could reflect the privatization of editing tests, so hiring managers do not have access to publically available models. Variations could also relate to the sample size. Finally, the variations could reflect highly contextualized environments. For example, qualitative data indicated that hiring managers often imposed time limits or offered no limits to evaluate how applicants worked under pressure, if they appropriately queried the author, or displayed tendencies of over-editing. In other words, hiring managers did not always design their tests to assess what applicants thought was being assessed but instead the qualities these managers sought in a technical communicator and a new colleague. This then justifies the preference toward holistic test assessment; however, this approach invites subjectivity and suggests why technical communicators could dismiss the value or need of these tests.

The weighted index of the sample's 71 usage errors provides a valuable resource to both practitioners and academics. The results from this second study reaffirmed the importance other researchers have placed on considering error in context (Haswell, 1988; Lunsford & Lunsford, 2008). For example, "Unnecessary or missing capitalization" was a predominant error in the editing tests because they tested applicants' knowledge of a style guide. However, the significant presence of this error in other error studies relates to other factors. Lunsford and Lunsford (2008) attributed the high frequency of capitalization errors in college writing to technology and the development of these student writers; MS-Word automatically capitalized words that followed a period (for example, a period used in an abbreviation), and students often capitalized terms to suggest significance (for example, "High School Diploma"). These observations indicate that though developing and expert writers make similar errors, they make them for different reasons. This knowledge is valuable for self-correction but also for academics who teach error for professional writing purposes.

It is also valuable to explore how the predominant error types in the editing tests reflect the error types that appeared in studies of college-level writing. Five errors were consistent across this study and both the Lunsford

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and Lunsford (2008) and the Connors and Lunsford (1988) studies: misspelling, wrong word, unnecessary shift in verb tense, missing comma with a nonrestrictive element, and unnecessary or missing apostrophe (see Table 7). Further, almost all of the predominant editing test errors related to grammar and mechanics, punctuation, and spelling were also top errors in either

of the previous studies. These overlapping errors indicate some universally shared beliefs across writing registers. What is unique about the present study's error list is the increased number of errors related to style and content. These errors included "Redundant, expendable, or incomparable language," "Incorrect number format," "Faulty parallel structure," and "Inconsistent

Table 7. This Study's List of 16 Predominant Errors and Top 20 Lists of College Writing Error Taxonomies

Boettger (2014)	Lunsford & Lunsford (2008)	Connors & Lunsford (1988)
Wrong word	Wrong word	*Missing comma after an introductory element
Misspelling	Missing comma after an introductory element	Vague pronoun reference
Unnecessary or missing capitalization	Incomplete or missing documentation	Missing comma in a compound sentence
Redundant, expendable, or incomparable language	Vague pronoun reference	Wrong word
Misplaced/dangling modifier	Misspelling (including homonyms)	Missing comma with a nonrestrictive element
Hyphen, en- or em-dash errors	Mechanical error with a quotation	Wrong/missing inflect endings
Incorrect number format	Unnecessary comma	Wrong or missing preposition
Unnecessary shift in verb tense	Unnecessary or missing capitalization	Comma splice
Lack of subjective-verb agreement	Missing word	Possessive apostrophe error
Missing or wrong article	Faulty sentence structure	Unnecessary shift in verb tense
Faulty parallel structure	Missing comma with a nonrestrictive element	Unnecessary shift in person
Missing comma with a nonrestrictive element	Unnecessary shift in verb tense	Sentence fragment
Unnecessary or missing apostrophe (including its/it's)	Missing comma in a compound sentence	Wrong tense or verb form
Incorrect singular/plural application	Unnecessary or missing apostrophe (including its/it's)	Lack of subjective-verb agreement
Inconsistent terminology	Fused (run-on) sentence	Missing comma in a series
Missing comma in a series	Comma splice	Lack of pronoun-antecedent agreement
…	Lack of pronoun-antecedent agreement	Unnecessary comma with restrictive element
…	Poorly integrated quotation	Fused (run-on) sentence
…	Unnecessary or missing hyphen	Misplaced/dangling modifier
…	Sentence fragment	Its/it's error

Misspelling outnumbered all other errors in this sample by 300%, making it the actual top error.

terminology." In total, the weighted index included 17 style and 10 content related errors. The weighted index also included seven lowly ranked design errors, which were not identified in the previous studies. Collectively, these previously unidentified error types emphasize the need for studies specific to technical communication.

The most significant result from the third study was that technical communicators' perceptions of error did not correlate with the frequency or dispersion of those same errors in the editing tests (Figure 2). In fact, 75% of the errors that professionals placed in the moderately bothersome tier (the highest tier in this study) were errors that were infrequent and weakly dispersed in the editing tests (Table 4). These disparities could indicate the level of interpretation associated with the general concept of *error* as well as our individual biases toward and knowledge of specific error types. For example, "Hyphen, em-, and en-dash" ranked sixth in the weighted index but bothered the professional communicators the least. It is possible that this error type shares some of the same features "Missing comma in an introductory element" represented in the college writing taxonomies; it appears in writing frequently but is marked infrequently because it usually does not impair comprehension. Another explanation could be that the professionals did not have a complete understanding of the differences among hyphens, em-, and en-dashes, and so this error type carried less significance than others.

Limitations

Careful attention was given to the methodological design and the error classifications, but this study is not without limitations. The examination of 55 editing tests provides the best information on the genre, but it is not a representative sample. The privatization of this genre invites more subjectivity in its design and contents because of a lack of publically available examples. Consequently, the error results reported in the second study cannot be generalized beyond the parameters of the sample. Results from the survey also cannot be generalized. Participants were asked to register an opinion of a single usage error within an isolated sentence rather than examining that error within the context of several paragraphs and in relation to other errors. Hiring managers placed errors in their tests because of situation and context, and survey participants responded to error in structured environment where they knew an error was likely present. These differences could influence validity.

Future Research

I designed these three studies to extend the assumptions about editing tests and error and to motivate new research in these areas. This study offered perspective on how and why hiring managers construct these tests, but future studies could also evaluate if alternative assessments better reflect an applicant's skill set. More research should investigate the role of editing tests as authentic assessment tools.

Results from this study also showed a correlation between error and context, and this relationship merits additional research. For this study, I identified editing tests from companies that represented a variety of industries. Additional studies on specific industries would likely produce valuable information. For example, in an analysis of medical editing tests, "Wrong Word" ranked lower (13th) than it did in this study (Boettger, 2012). Additionally, six of the 20 predominant errors in the medical study related to style, including, "Inconsistent terminology," "Informal or discriminatory language," and "Unnecessary passive construction."

Additional follow up is needed on how technical communication professionals perceive error, particularly compared to how other audiences like academics perceive these errors. Results from these studies would indicate overlap and divergence and suggest ways to train the next generation of technical communicators.

Finally, I designed these three studies to contribute to the small, but growing body of empirical technical editing research. Technical editing is arguably the most underdeveloped subfield of technical communication because unverified common knowledge often dictates the best practices. For example, Eaton et al. (2008a; 2008b) identified multiple concepts that editing literature had presented as common knowledge yet had not been examined on a larger scale, including the adversarial relationship between the editor and author and the best way to phrase editorial comments. To date, the best source of information on editing tests and error patterns specific to our field fall into the category of unverified common knowledge. Therefore, the findings from these current studies should motivate future research and also redirect practitioners and academics from focusing on our personal preferences of errors to addressing why certain audiences in our field perceive and prioritize error differently.

Technical Communication Editing Test

Acknowledgments

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About The Author

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Enabling Employees to Work Safely: The Influence of Motivation and Ability in the Design of Safety Instructions

Pieter A. Cornelissen, Joris J. van Hoof, Mark van Vuuren

Abstract

Purpose: One of the major challenges for modern organizations is to create healthy and safe work environments, as evidenced by the number of occupational deaths (worldwide: four per minute), and an even higher number of injuries. This study explores different levels of motivation and ability, to identify which are most relevant for safety climate and safety performance. This study aims to pinpoint the areas information designers should focus on to most effectively contribute to healthy and safe work environments.

Method: We designed a questionnaire for employees of a Dutch high-tech and high-risk warehouse, a workplace where safety regulations are important. The employees scored their attitudes regarding motivation, ability, safety climate, and safety performance.

Results: The results confirmed the expected relationship between safety climate and safety performance. Of the explored sublevels of motivation and ability, personal motivation and external ability proved most relevant for creating a healthy safety climate and healthy safety performance.

Conclusion: In the design of safety instructions, focusing on personal motivation and external ability seems a promising strategy for contributing to healthy and safe work environments, especially in high-risk environments.

Keywords: motivation, ability, safety instructions, safety climate, safety performance

Practitioner's Takeaway

- This study shows that the sublevels personal motivation and external ability are most relevant for creating a healthy safety climate and optimal safety performance. Information designers should focus on these areas when designing safety instructions for high-risk workplaces.
- Personal motivation can be affected through safety instructions by person- alizing general safety instructions— making them more realistic—and by making employees aware of the possible (negative) outcomes resulting from instruction non-compliance.
- External ability can be communicated in safety instructions by emphasizing that employees are and can be a role model for their colleagues.

Introduction

Worldwide, every minute, four workers die from a work-related accident or disease, and every minute, 640 workers have a work-related accident (International Labour Oganisation [ILO], 2013). Extrapolating those numbers leaves us with 5,760 occupational deaths per day, and 2.1 million work-related deaths per year worldwide. According to the ILO, any deaths, diseases, or injuries resulting from an occupational accident are classified as an injury. Comparably, ILO (2014) defines an occupational disease as "a disease contracted as a result of an exposure over a period of time to risk factors arising from work activity," and an occupational accident as "an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work which results in one or more workers incurring a personal injury, disease or death" (ILO, 2014).

Contrary to popular beliefs, occupational injuries are not merely an immense problem in developing countries, but also in the developed countries. In the Netherlands, for example, nearly 450 thousand workers (on a total working population of around 7 million) were injured on the job in 2013 (Statistics Netherlands, 2014). Around half of these injured workers missed out one day of work, and over a third of them missed over four workdays. These numbers have been relatively stable since 2005 (Statistics Netherlands, 2014), which indicates an ongoing need for a further increase in workplace safety. Apart from the emotional toll of work-related accidents on the injured workers, their families and colleagues, the cost of these accidents equals an estimated 4% of the global gross domestic product each year (ILO, 2010).

Nowadays, most of the bigger companies in risk industries have instituted an Environment, Health and Safety (EHS) department, a department charged to secure and improve the company's environmental, (employee) health, and (employee) safety efforts, such as assessing risks, reducing waste, and improving work conditions for employees by introducing ergonomic workstations. The matter is becoming increasingly important with increased external EHS regulations and government control (Cahill, 2010; Hofmann, Jacobs, & Landy, 1995). The importance of EHS for the public image and corporate risk profile is increasing (Chinander, Kleindorfer, & Kunreuther, 1998; Hasan & Jha, 2013). Organizations could benefit from these

measures in additional ways as research has associated workplace safety with both organizational climate (for example, Neal, Griffin, & Hart, 2000) and job satisfaction (Gyekye, 2005), which are both important for employee well-being. Combining the organizational, financial, and emotional costs of workplace accidents provides a societal relevance of the topic.

In an attempt to find a conclusive solution to safety, researchers have focused on demographics like age and tenure (Mearns, Whitaker, & Flin, 2003; Gyekye & Salminen, 2009), and behavioral aspects of workers and management (for example, Cheng, Leu, Lin, & Fan, 2010; Jonson, 1982 as cited by Coyle, Sleeman, & Adams, 1995; Margolis, 1973 as cited by Coyle et al., 1995; Unsar & Sut, 2009).

Addressing safety through behavior can be advantageous to organizations since major modifications to the building, machinery, or equipment are not necessary (Swuste, Van Gulijk, Zwaard, & Oostendorp, 2014). Creating safe environments can be achieved in two ways; first, through adjustment of employee behaviors (for example, altering standard operating procedures, or training) (Swuste, Van Gulijk, & Zwaard, 2010), and second, through (for example, designing out hazards, guarding of hazards, and warning employees) (Ponnet, Reniers, & Kempeneers, 2014).

Compared to adapting machinery, equipment, and/or the building, creating effective safety instructions that explain appropriate employee behaviors can be a relatively easy and cheap way to increase safety in the work environment. Safety instructions are one of the cornerstones of the risk control system, being the translation from top management commitments into specific details (Hale & Borys, 2013). Safety instructions are instituted to specify, communicate, and control safe behavior among employees in dangerous situations, and to prevent accidents from happening (Elling, 1997; Hale, 1990; Herrerro, Saldaña, Del Campo, & Ritzel, 2002). Designing effective safety instructions is complex, and all too often, these are deemed to be too strongly focused on technical requirements (Herrero et al., 2002), to be unrealistic (Hale & Borys, 2013), or to solely serve the interests of the organization (Elling, 1997). Another problem with safety instructions is that they can be misinterpreted, resulting in unsafe behaviors (Racicot & Wogalter, 1995). So, while safety instructions can be beneficial, their design is not without problems. This is especially important in high-risk work environments

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where even the slightest problems with safety instructions can have catastrophic consequences. In this study, we focus on motivation and ability attitudes of warehouse employees to provide insight in how to write effective safety instructions for high-risk work environments.

In late 2013, we had the opportunity to explore the extent to which the sublevels personal motivation and external motivation, as well as personal ability and external ability, affect safety climate and safety performance.

Workplace Safety

According to the International Labour Organization and the World Health Organization, workplace safety—or occupational health—should aim at:

> …the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities and; to summarize: the adaptation of work to man and of each man to his job. (International Labour Organization, 1998, p. 21)

Many researchers have tried to find a way to positively affect workplace safety. In their studies, safety performance was often perceived as an indicator of workplace safety. However, little consensus exists on which approach is the right one to increase the safety performance of employees.

Safety Climate and Safety Culture

Workplace safety refers to actual, measurable employee well-being, but workplace safety also has a more perceptual side to it. Safety climate and safety culture are parts of this perceptual side of workplace safety. Safety climate consists of shared beliefs (that is, perceptions) of safety in the workplace (Díaz & Cabrera, 1997; Gyekye & Salminen, 2009). These shared perceptions are also referred to as perceptions of workplace safety.

The concept safety climate is often wrongly used as a synonym of safety culture. Yule (2003) looked into both concepts from a conceptual and theoretical point of view and found that, in line with the work of others (Cox &

Flin, 1998; Guldenmund, 2000), the two concepts refer to different levels. Although the concepts share elements, these might not be reflective of a unitary concept, but rather work as independent concepts that complement each other (Yule, 2003).

Safety culture has to be viewed as a sub-facet of organizational culture, and exists at a higher level of abstraction than safety climate. It is characterized by "shared underlying beliefs, values, and attitudes towards work and the organization in general" (Yule, 2003, p. 3), whereas safety climate appears to be closer to operations and is "characterized by day-to-day perceptions towards the working environment and practices, organizational policies, and management" (Yule, 2003, p. 3). Perceptions of workplace safety are important for actual occupational safety as they are associated with variables relating to industrial accident rates and levels of job-related anxiety, stress, and exposure to environmental hazards (Hayes, Perander, Smecko, & Trask, 1998). Perceptions of workplace safety are indicators of safety performance (Cooper & Philips, 2004; Gyekye & Salminen, 2009; Hayes et al., 1998; Neal & Griffin, 2006). The latter seems to be partially affected by safety knowledge and motivation (Zhou, Fang, & Wang, 2008, p. 1410). The combined findings, which are in line with a variety of sources (for example, DeJoy, Schaffer, Wilson, Vandenberg, & Butts, 2004; Guldenmund, 2000; Gyekye & Salminen, 2009; Jiang, Yu, Li, & Li, 2010; Neal et al., 2000; Pousette, Larsson, & Törner, 2008; Silva, Lima, & Baptista, 2004), lead to the hypothesis (H1) that higher levels of perceptions of workplace safety (that is, safety climate) will be accompanied by higher levels of safety performance as depicted in Figure 1.

Scientific and practical studies demonstrate that the solution to workplace safety has been sought from a variety of angles. The idea that motivation and ability are responsible for performance dates back to 1955, when Maier (as cited in Burke, Sarpy, Tesluk, & Smith-Crowe, 2002) specified motivation and ability as determinants of job performance. Since then, this idea gained a lot of attention in research (Burke et al., 2002), with mixed results. Campbell *et al.* (1993, as cited in Neal et al., 2000) stated that only three determinants are responsible for individual differences in safety performance: motivation, skill, and knowledge. These findings, combined with the findings by Zhou *et al.* (2008), lead to the belief that the proposed classification (that is, motivation and ability) is the right choice to approach
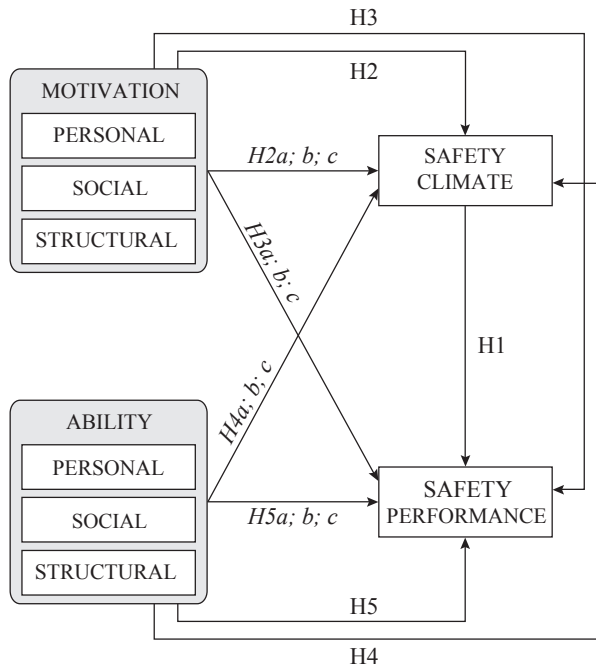
Figure 1. Hypothesized Influence of Three Levels of Motivation and Ability on Safety Climate and Safety Performance

the matter of workplace safety. Additionally, research by Hofmann *et al.* (1995) provides leads that indicate the usability of viewing motivation on different levels (for example, individual, micro, and macro). Below, we will elaborate on the concepts motivation and ability, and extend the different motivational levels as indicated by Hofmann *et al.* (1995) to ability.

Motivation
Motivation has been equated with behavioral intention (Sheeran, 2002) although the Theory of Planned Behavior (TBP) (Ajzen, 1991) shows that social norms and perceived control also play a role in people's behavioral intention and actual behavior. In general, people will assume that safety behavior is a very easy choice: Not acting in a safe way will increase the risk of getting involved in an accident. Andriessen describes motivation as "the result of a—not necessarily conscious—decision making process, in which a person weights the advantages and disadvantages of different acts (different kinds of work behaviour) and then chooses the behavior with the best yield (that is, he is then motivated to that act)" (Andriessen, 1987, p. 368). It is therefore hypothesized that higher levels of motivation will lead to higher levels of safety climate (H2) and safety performance (H3). However, other levels of motivation

play a role as well. Consider the following situational factors: "the esteem of colleagues (because you're seen as tough or because you are not childish), the esteem of the supervisor (because you don't hold up the work), and more convenience (because you don't constantly have to be on your toes)" (Andriessen, 1978, p. 368). These all produce counterweight to the perceived risk of accidents.

On a personal level, motivation can be viewed as the intrinsic desire or choice people make to act in a certain way. It is therefore hypothesized that higher levels of personal motivation among employees will lead to higher levels of safety climate (H2a) and safety performance (H3a).

In the early 1960s, Milgram shocked the world when he revealed the power peer pressure can exert over others in his famous experiments on obedience to authority (for further information, see Milgram, 1963). A link with the TPB (for more information, see Ajzen, 1991) is easily made, as social motivation is similar to the subjective norm. According to the TPB, the subjective norm is based on a combination of normative beliefs—"the likelihood that important referent individuals or groups approve or disapprove of performing a given behavior" (Ajzen, 1991, p. 159)— and a person's motivation to comply. In other words, we humans find it important what others think of us, and how they see us to such an extent that we might even change our behaviors for it. This notion also underlies the two-step flow theory (for more information, see Katz, 1957), which indicates that personal contacts are considered far more important than direct mass media messages. It is therefore hypothesized that higher levels of social motivation will lead to higher levels of safety climate (H2b) and safety performance (H3b).

Last, a third level of motivation was proposed by Andriessen's (1978) research, in which management exerted influence through rewards and penalties (see also Hasan & Jha, 2013). It is therefore hypothesized that higher levels of structural motivation will lead to higher levels of safety climate (H2c) and safety performance (H3c).

Ability
Ability consists of the combination of skill and knowledge people acquire through training. It is hypothesized that higher levels of ability will lead to higher levels of safety climate (H4) and safety performance (H5). Again, we hypothesize that ability consists of different levels.

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Personal ability is about influencing (enhancing) the practical and theoretical know-how of individuals to enable them to perform the desired vital behaviors. Organizations (attempt to) do so by providing training and instructions to their employees. It is therefore hypothesized that higher levels of personal ability will lead to higher levels of safety climate (H4a) and safety performance (H5a).

A social level of ability is similar to social capital. Although social capital might seem a relatively new concept due to the increased attention it has been given in the last decade, it is far from new. Farr (2004) traced the term back to 1916—when Lyda J. Hanifan supposedly used the concept for the first time—and conceptualized social capital as:

> The network of associations, activities, or relations that bind people together as a community via certain norms and psychological capacities, notably trust, which are essential for civil society and productive of future collective action or goods, in the manner of other forms of capital. (p. 9)

In laymen's terms, social capital reflects as much as: the whole is greater than the sum of the parts. In this equation, "the whole" is the capital, often in forms of knowledge. The "parts" consist of actors in a specific society or social network. It is hypothesized that higher levels of social ability will lead to higher levels of safety climate (H4b) and safety performance (H5b).

The last level of ability, structural ability, refers to nonhuman power. The main question revolves around the environment: How can it be used and transformed to enable change? Here, one can think of getting the right equipment, decorating a building, designing the physical lay-out of a building, and so on. The power that can exert from changes in the environment people work or live in has been proven in numerous fields, some more well-known than others (for example, Sonderegger & Sauer, 2010; Van der Woning, 2008). The inclusion of structural ability also counters criticism on the classification of safety performance as provided by Campbell *et al.* (1993, as cited in Neal et al., 2000), that situational factors should be taken into consideration, for these can be of influence as well (Neal et al., 2000). It is therefore hypothesized that higher levels of structural ability will lead to higher levels of safety climate (H4c) and safety performance (H5c).

Method

To test the hypothesized effects of motivation and ability on safety climate and safety performance, we designed a questionnaire for employees of a Dutch high-tech and high-risk warehouse.

Procedure

All employees were approached via their (direct) supervisors, and given time off from their work to complete our questionnaire. In groups of five to ten—depending on how many employees were needed in the warehouse—employees went to a conference room that was made available for this purpose. Upon entrance, participants chose an English or a Dutch language version of the questionnaire. They were then asked to carefully read the introduction and instructions on the first page, and to subsequently answer the questions. During the study, one of the researchers was continuously available for questions. The employees returned their completed questionnaires to the researcher without the involvement of supervisors or colleagues.

Participants

Of all available warehouse employees coming into contact with high-risk products ($N = 92$), 77 participated in our study. They worked at different departments in the warehouse, with activities varying from picking products to (un)loading trucks and processing incoming products. Participants were predominantly male ($n = 54$) as opposed to female ($n = 18$); 5 values were missing. The age of the participants ranged from 19 years old to 62 years old, with a mean of 40.2 years, while tenure ranged from 3 weeks to 9 years, with a mean of 4.8 years. Of the employees who disclosed their job situation, 53% were structural employees, 12% were employed as a contractor, and 13% had a flex-worker contract.

Instrument

Data were collected through a questionnaire consisting of 50 items, which were divided into eight different constructs, using a five-point Likert scale ranging from *totally disagree* to *totally agree*. The eight constructs are a mix of existing scales and questions designed for the specific professional environment of our study, and will be discussed here.

We used the six-item scale by Hahn and Murphy (2008) to measure safety climate. This scale showed

good internal consistency before, with Cronbach's alpha coefficients between .71 and .85. An example item is: "The health and safety of workers is a high priority with management where I work."

We used items from several sources to measure safety performance. First, we used a shortened version of Whu, Chen and Li's (2008) scale, with reported Cronbach's alpha coefficients between .89 and .96 in earlier research. Second, we used items that were designed for our specific context, with a total of 14 items in the final scale. An example item is: "I have not been injured in the workplace within the 12 past months."

The six predictors (i.e. personal, social and structural levels of both motivation and ability) were measured using an adapted version of Williamson, Feyer, Cairns, and Biancotti's (1997) scale. We used 23 items from this instrument, of which two were reformulated, and designed seven new items for the specific context, resulting in five items per subscale, and 30 items in total. Below we provide example items of each subscale:

- Personal motivation (the intrinsic desire or choice of individuals to act in a certain way): "I feel motivated to behave safely in my workplace."
- Personal ability (the practical and theoretical know-how of individuals): "When I have worked unsafely it has been because I was not trained properly."
- Social motivation (the influence of direct colleagues on individuals' choice to act in a certain way): "It would help me to work more safely if my workmates supported safe behavior."
- Social ability (the practical and theoretical know-how of direct colleagues): "My co-workers know how to safely operate equipment."
- Structural motivation (the influence on individuals' behavior exerted by the management through rewards and penalties): "It would help me to work more safely if I was rewarded (paid more) for safe behavior."
- Structural ability (the influence of non-human, situational factors such as equipment): "When I have worked unsafely it has been because the right equipment was not provided or wasn't working."

Furthermore, at the end of the questionnaire, we added five questions to measure relevant background and professional characteristics (gender, age, work tenure, type of contract (regular employee, contractor, or flex worker), and primary department of employment). Employees were also asked to grade the company's health and safety program (ranging from 1 to 10), and given the opportunity to leave remarks.

The final instrument was pretested with three experts to evaluate the items' clarity and relevance. This pretest led to some minor textual improvements. Additionally, we pretested the final questionnaire with four nonparticipating employees to confirm the comprehensibility of the items.

Analysis
We entered the data from the 77 questionnaires into SPSS 20.0, and checked the file for errors. As a result, the data of two questionnaires were removed due to a large number of missing data. Subsequently, we recoded negative items and calculated the reliability of each construct, which resulted in a factor analysis and a regrouping and relabeling of the constructs. Finally, we conducted a multiple regression analysis to validate the research model.

Results

The safety climate and safety performance scales showed good internal consistency with Cronbach's alpha coefficients of .78 and .80. None of the scales intending to measure the different levels of motivation and ability (that is, personal motivation, social motivation, structural motivation, personal ability, social ability, and structural ability) showed sufficient internal consistency (Cronbach's alpha coefficients between .12 and .59). We therefore decided to conduct Principal Components Analysis (PCA) to further investigate those data and identify the underlying structure.

Exploring the Structure of Motivation and Ability
We followed the method of principal components analysis to determine the structure underlying the items used to measure levels of motivation and ability. Initially, the factorability of the items was assessed using several well-recognized criteria. With a value of .62, the 30 items intending to measure the six different variables exceeded the recommended value of .60 on the Kaiser-Meyer-Olkin test (Kaiser, 1970, 1974). Bartlett's Test of Sphericity (Bartlett, 1954) showed statistical significance for the 30 items, which supports the factorability of the correlation matrix. Principal

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components analysis revealed the presence of ten components with eigenvalues exceeding 1, together explaining 74.4% of the total variance. An inspection of the scree plot revealed three cut-off points; after the second, fourth, and sixth component. Based on Catell's (1966) scree test, we decided to retain four components for further investigation. The four-component solution explained 49.3% of the total variance, with the component 1 through 4 explaining 19.3%, 16.2%, 7.1%, and 6.7% of the total variance respectively. Based on the scree test we assume that there are four variables underlying motivation and ability. To aid in the interpretation of these four components, Oblimin rotation was performed. The rotated solution revealed the presence of simple structure (Thurstone, 1947, as cited in Pallant, 2011), with all components showing several strong loadings. The different factors showed very weak intercorrelations (-.19, -.16, .03). To confirm the newly found structure of the variables, scale reliability was retested (see Table 1).

Following these findings, the variables social motivation and structural motivation, as well as the variables social ability and structural ability were combined, resulting in the new variables external motivation and external ability. Reliability analysis showed that the internal consistency of the personal ability scale was $\alpha = .60$. Because this was still within the latitude of acceptance, we decided to retain the personal ability scale as a research instrument.

Relationships between Motivation, Ability, Safety Climate, and Safety Performance

We used regression analyses to investigate the relationships between levels of motivation, ability, safety climate and safety performance. A regression analysis was conducted to determine the extent to which safety climate significantly predicted safety performance. Results confirmed H1, hypothesizing that safety climate is a predictor of safety performance levels (see Table 2 for a summary of the analysis). Safety climate also explained a significant proportion of variance (60%) in levels of safety performance.

Multiple linear regression analyses were used to develop a model for predicting levels of safety climate based on levels of motivation, and ability (both for motivation and ability as a main construct and with sublevels of motivation and ability). Statistics and regression coefficients are depicted in Table 2. From the analysis it showed that only ability as a whole significantly ($p < .001$) predicted safety climate, while the second analysis showed that only external ability

Table 1. Scale Reliability After Factor Analysis

Construct	# of items	Cronbach's
Motivation	11	.85
Personal motivation	5	.78
External motivation	6	.77
Ability	17	.81
Personal ability	5	.60
External ability	12	.86

Table 2. Summary of Hierarchical Regression Analysis for Variables Predicting Safety Climate

	Model 1			Model 2		
Variable	B	SE B	β	B	SE B	β
Motivation	-.14	.08	-.16			
Ability	.87	.11	.70***			
Personal motivation				-.13	.08	-.17
External motivation				.04	.08	.05
Personal ability				.12	.08	.13
External ability				.76	.09	.71***
Adjusted R^2		.54			.56	
F for change in R^2		38.46***			21.80***	

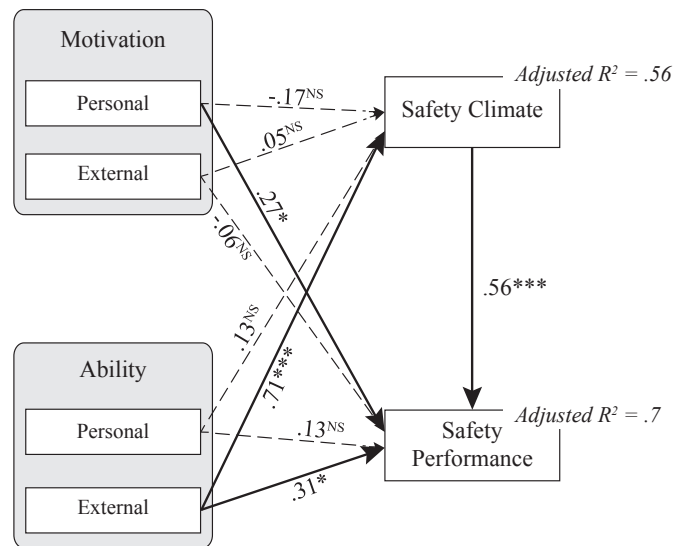*$p < .05$; ** $p < .01$; *** $p < .001$.
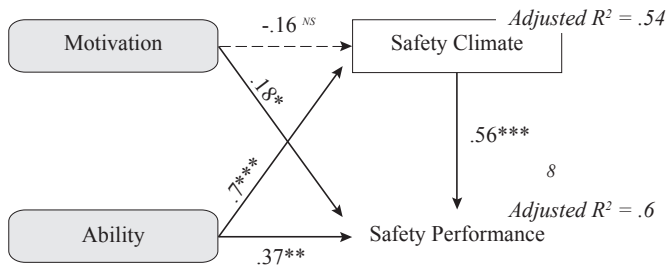
Figure 2. Regression Model Depicting the Causal Relation of Motivation and Ability on Safety Climate and Safety Performance. Dashed Lines Indicate Non-Significance.
*$p < .05$; ** $p < .01$; *** $p < .001$.

significantly ($p < .001$) predicted safety climate. The two predictor model (motivation and ability) was able to account for 54% of the variance in safety climate, while the four predictor model was able to account for 56% of the variance in safety climate.

Multiple linear regression analyses were used to develop a model for predicting levels of safety performance based on levels of safety climate, motivation, and ability, both for motivation and ability as a main construct (Figure 2) and with sublevels of motivation and ability (Figure 3). Statistics and regression coefficients are depicted in Table 3. From the analysis it showed that all predictors significantly–safety climate ($p < .001$), ability ($p = .001$), and motivation ($p = .022$)–predicted safety performance, while the second analysis showed that only safety climate ($p < .001$), personal motivation ($p = .004$),

Figure 3. Regression Model Depicting the Causal Relation of the Two Levels of Motivation and Ability on Safety Climate and Safety Performance. Dashed Lines Indicate Non-Significance.
*$p < .05$; ** $p < .01$; *** $p < .001$.

and external ability ($p = .005$) significantly predicted safety climate. The three predictor model (safety climate, motivation, and ability) was able to account for 68% of the variance in safety climate, while the five predictor model was able to account for 70% of the variance in safety climate.

Following the less well-established identification of the general importance of external ability for both safety climate and safety performance, we conducted a

Table 3. Summary of Hierarchical Regression Analysis for Variables Predicting Safety Performance

Variable	Model 1			Model 2			Model 3		
	B	SE B	β	B	SE B	β	B	SE B	β
Safety climate	.58	.06	.78***	.42	.08	.56***	.411	.08	.56***
Motivation				.12	.05	.18*			
Ability				.34	.1	.37**			
Personal motivation							.15	.05	.27**
External motivation							-.04	.05	-.06
Personal ability							.08	.05	.13
External ability							.243	.08	.31*
Adjusted R^2		.60			.68			.70	
F for change in R^2		98.63***			44.35***			29.2***	

*$p < .05$; ** $p < .01$; *** $p < .001$.

regression analysis for the separate items of those scales. This allowed us to see which elements needed to be highlighted in the design of safety instructions. The regression analysis showed that for safety climate, the strongest indicator was that "Our management supplies enough safety equipment." For safety performance, awareness that "My co-workers use their personal protective equipment correctly" is the most important aspect. We will explore the implications of these findings in the discussion.

Discussion

This study confirms the relation between safety climate and safety performance (H1) as hypothesized and shown in previous research (DeJoy et al., 2004; Guldenmund, 2000; Gyekye & Salminen, 2009; Jiang et al., 2010; Neal et al., 2000; Neal & Griffin, 2006; Pousette et al., 2008; Silva et al., 2004), and the finding that this relation is partially affected by knowledge (that is, ability) and motivation (Zhou et al., 2008). Additionally, this study shows that the Safety Climate scale developed by Hahn and Murphy (2008), as well as the shortened version of the safety performance scale developed by Whu *et al.* (2008) can be seen as reliable, as they showed good internal consistency, which reconfirms their usability for future research.

This study shows the importance of two levels of motivation and ability as predictors of safety climate and safety performance. Making use of factor analysis, we were able to distinguish between personal and external motivation, and between personal and external ability. The latter showed the strongest power in predicting safety climate and safety performance.

The research model was based on the assumption that higher (sub)levels of motivation and ability would result in higher levels of safety climate and safety performance. The results from the regression analysis confirm the predicted relations between motivation and safety performance (H3), between ability and safety climate (H4), and between ability and safety performance (H5). However, the model was able to predict a greater sum of the variance in safety climate (56%) and safety performance (70%) with the inclusion of the different sublevels, compared to only motivation and ability (54% for safety climate, and 68% for safety performance). This indicates that the inclusion of different levels, as done by Hofmann *et al.* (1995), is justified.

For motivation, only the subconstruct of personal motivation proved to be a significant predictor for safety performance, thereby confirming hypothesis H3a. Of both the ability subconstructs, only external ability proved to be a significant predictor, for both safety climate and for safety performance after controlling for safety climate. Thus, hypothesis H4b and H5b were confirmed. This indicates that higher levels of (external) ability predict higher levels of safety climate and safety performance.

Although not statistically significant, the direction of motivation and its sublevels as predictors of safety climate differed from the hypothesis. Instead of a positive relation, the relation between (personal) motivation and safety climate was negative. This indicates that a person will feel less motivated to pursue safety if he or she perceives the environment as safe. A similar result was found for external motivation as a predictor of safety performance, which indicates that higher levels of external motivation result in lower levels of safety performance. This implies that an increase in effort to motivate an employee externally results in lower levels of safety performance as perceived by that employee. These findings are in line with previous research into risk behavior (Brewer, Weinstein, Cuite, & Herrington, 2004).

Implications for Safety Instructions

The findings of this research—that personal motivation and external ability are the largest predictors of safety climate and safety performance—have important implications for practitioners. If motivation and ability are not the singular constructs they are commonly thought to be, materials used to enhance or affect them should be changed accordingly.

According to Geller (2003, as cited in Saleh, 2011, p.5), safety is internally derived, meaning that individuals must understand the why behind the "rules" and "procedures." The necessity of personal motivation in safety instructions was also found in a study by Elling (as cited in Hale, 1990), who found that 71% of the employees thought too little motivation was given to follow the instructions. The inclusion of personal motivation also forces writers of safety instructions to think beyond the interests of the organization (Elling, 1997), and to extend the focus beyond merely technical requirements (Herrero et al., 2002) and being unrealistic (Hale & Borys, 2013), which is common criticism on contemporary safety instructions. Personal motivation

could be included in safety instruction by raising the risk awareness (Harvey, Bolam, Gregory, & Erdos, 2001) of employees, for example through mentioning negative outcomes of non-compliance.

A noteworthy finding from this study is the fact that external ability plays an important role in affecting levels of safety climate and safety performance. The additional analysis into the relation between external ability on the one hand and safety climate and safety performance on the other showed that the top 5 items were related to the availability, training, and use of safety equipment. Although the importance of external ability is seemingly eliminating the need for ability of the individual, the fact that the ability of the co-workers and the organization is of such great importance to the individual employee stresses the importance of proper training of every employee in the organization (Burke et al., 2006; Dedobbeleer & German, 1987). We propose that external ability in an organization can serve as a form of behavioral modeling through which the individual employee can see how he or she should interpret safety instructions and put them into practice (Racicot & Wogalter, 1995), as well as enhance the self-efficacy of employees through proxy efficacy (Bray, Gyurcsik, Culos-Reed, Dawson, & Martin, 2001). Proxy efficacy "reflects one's confidence in the skills and abilities of a third party or parties to function effectively on one's behalf" (Bray, Gyurcsik, Culos-Reed, Dawson, & Martin, 2001, p. 426), but is also thought to work the other way around, contributing to successful behavioral adaptation (Bandura, 1997, as cited by Bray, Gyurcsik, Culos-Reed, Dawson, & Martin, 2001). One way in which external ability could be incorporated in safety instructions is by emphasizing that employees are and can be a role model to their colleagues. Such inclusion could (partly) account for the effect coworkers can have on individual behavior (for example, "My co-workers use their personal protective equipment correctly"). An additional benefit here could be that personal motivation and external ability can strengthen each other through proxy efficacy.

The other important items resulting from the additional analysis place an emphasis on the management. We therefore propose expressing management commitment in safety instructions. However, one should be cautious here. Hale (1990, p. 4) states that: "Imposed safety rules are often seen as in conflict with other imposed rules of a higher priority" (for example, production). This notion, mirrored to the

heroes described by Bergson (Dragga, 2011, p. 6), points out that if management sets safety as their priority but does not walk the talk, then the behavior that is seen as heroic is that of production and not safety. This imposes serious threats to the safety of every single employee.

Limitations and Implications for Research

Notwithstanding the contribution of this research to the understanding of workplace safety, and its confirmation of previous findings, it has some limitations. Although the coverage among employees achieved in the organization was high (around 90%), the number of participants ($N = 75$) is up for improvement. We recommend to replicate this research in different settings and organizations to verify our findings. A second limitation comes from barriers that exists in "capturing" behavior and emotions through the use of questionnaires. This limitation is twofold, as it refers both to the measurement of actual thoughts and emotions, and to the fact that the questionnaire was unable to "capture" all of the hypothesized sublevels of motivation and ability. The latter may have occurred because such a perceived difference between the levels was absent, or because the items in the combined scale cancelled each other out. The latter would explain why there is no statistically significant finding for social motivation, a force that has been shown to be of influence numerous times in previous research (for example, Ajzen, 1991; Andriessen, 1978; Milgram, 1963). While some research has indicated that external motivation in the form of rewards and penalties is effective (for example, Hasan & Jha, 2013), there are strict limitations and also a large number of opponents (for example, Schwartz & Sharpe, 2010). Future research should therefore further investigate this gap between the proposed sublevels and the findings in this research.

Conclusion

This study investigated the presence of sublevels of motivation and ability, and their relation with safety climate and safety performance. The findings indicate that including the subconstructs personal motivation and external ability is more valuable than measuring motivation and ability as a whole. Our findings indicate that in the design of safety instructions, focusing on personal motivation and external ability seems a promising strategy for contributing to a healthy and safe work environment.

Enabling Employees to Work Safely

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Consistency & Contrast: A Content Analysis of Web Design Instruction

Heidi L. Everett

Abstract

Purpose: To investigate whether Web design rules historically are prescribed or whether designers are encouraged to think critically about how Web design choices relate to the complex situation of human-computer interaction. Specifically, this study explores how Web design rules have evolved since the mid-1990s and the influencing factors, if Web design instruction has dictated rules or encouraged designers to think critically about the design decisions being made, and, finally, if Web design principles are based on cognitive learning or visual communication theories, situated in best practices, or simply replicated.

Method: Content analysis of a sampling of 40 textbooks and general-interest publications on Web design from 1995 to 2014.

Results: Overall, Web design texts encourage designers to think critically about audiences. Changing technology clearly played a key role in the evolution of instruction. Finally, Web design instruction included some level of reference to cognitive learning theory or visual communication theory. While the appearance of theory-based word units in Web design texts coupled with discussion about technological capabilities and audience suggests Web design instruction does a solid job of situating design practices in theory, technology, and the complex situations in which the Web user operates, the depth of discussion varies greatly from text to text.

Conclusion: The various treatments of theory in texts calls for further study to better understand which approach is more effective in communicating the theories as a whole as well as their application in Web design.

Keywords: Web design, design principles, visual communication theory, cognitive learning theory, human computer interaction

Practitioner's Takeaway

- Web design and the Web user experience have quickly evolved and changed at a rate and in ways that traditional print never did.
- Understanding user expectations of design conventions for this ever-changing medium is ripe with challenges and opportunities.
- Cognitive learning theory and visual communication theory call for consistency, repetition, and similarity in order for Web users to learn, remember, and recognize information and organization on the Web.
- Designers must satisfy audience extremes and Web design instruction must facilitate careful consideration of these audiences as technology and user experiences rapidly change.

Content Analysis of Web Design Instruction

Introduction

In his April 2013 article "Cargo Cults in Information Design," Michael Albers discussed the problem of designers "rigidly applying design rules without a clear understanding of why the rule exists or whether it applies to the situation" (p. 59). He argued that "human-information interactions are inherently complex and nonlinear," and cargo cults emerge because of an "overly prevalent attempt at reducing complex situations to simple situations" that "apply across all situations" (2013, p. 59).

The study described below tests Albers' argument by examining how Web design rules are situated in complex human-computer interactions. Through a content analysis of 40 Web design books, it explores the evolution of Web design "rules" from the mid-1990s to today. The fundamental question under investigation is whether Web design rules are simply prescribed (without an understanding of *why*, to use Albers' phrase) or whether designers are encouraged to think critically about the design choices being made based on audience, context of use, and other factors.

This study is important for several reasons. First, research to date suggests Web design matters for the overall perceived credibility of a Website as well as the organization responsible for a Website (Fogg et al., 2003; Lazar, Meiselwitz, & Feng, 2007; Nielsen, 2002; Robins & Holmes, 2008).

Second, technological development in the first 20 years of the World Wide Web has been a continual game-changer for Web designers and Web users. In sharp contrast, the world of print has been relatively static for hundreds of years, allowing print designers and readers a set of predictable layout standards and expectations. As Walter Ong (1991) pointed out in his book *Orality and Literacy: The Technologizing of the Word,* print has been "locking up the type in an absolutely rigid position" (p. 122) and allowing for the mass production of "identical objects" (p. 126) in an "exactly repeatable visual statement" (p. 127). Web design and the Web user experience, on the other hand, has quickly advanced from the slow transferring of data via landlines and 26k modems hooked up to large, heavy, and cumbersome desktop computers to instant, unlimited data access via citywide Wi-Fi on mobile devices.

Further, Web users have been able to control several aspects of how they receive and interact with a Website, from receiving and viewing text-only versions on preferred browsers in the mid-1990s to viewing mobile-friendly versions and instantly contributing content today. Defining standards and best practices – as well as understanding user expectations – for this ever-changing medium is ripe with challenges and opportunities. The World Wide Web Consortium (W3C) has made great strides in developing Web standards for "building and rendering Web pages" and describing how to make pages "accessible to people with disabilities (WCAG), to internationalize them, and make them work on mobile devices" (Web design and applications). These standards are largely technology driven and less about how individuals perceive and understand information on the Web.

Third, reading print and reading online is different; therefore, the presentation of content should be treated differently. As Ong (1991) noted, "Just as writing reconstituted the originally oral, spoken word in visual space, print embedded the word in space more definitively" (p. 123). The visual space of the online environment can be anything but definitive, requiring Web designers and Web visitors to have different expectations about engagement with content. In the book *The Economics of Attention: Style and Substance in the Age of Information*, Richard Lanham (2006) argued that traditional typographical design of print "aims not to be seen," so readers "plunge without typographical self-consciousness right into the meaning" (p. 46). He refers to this world of print as "an economy of sensory denial" which "economizes on most of the things we use to orient ourselves in the world we've evolved in" (p. 46). In contrast, "digital expression has heightened our expressive self-consciousness both of words and of images and sounds" (p. 142). Web users are required to interpret more than words on a Web page and to interpret information in a non-linear fashion. Studies have shown screen-based reading behavior is characterized by more time spent on browsing and scanning, keyword spotting, one-time reading, non-linear reading, and reading more selectively; less time is spent on in-depth reading and concentrated reading (Liu, 2005; Kuiper et al., 2008). Web users – and Web designers – must develop and employ what Howard Gardner (2006) called "spatial intelligence" (p. 14). Gardner defined *intelligence* as the ability to "solve problems or fashion products that are of consequence in a particular cultural setting or community" (p. 6). Spatial intelligence allows for the "problem solving . . . required for navigation, visualizing

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objects from different angles, and understanding use of space" (Gardner, 2006, p. 14) as well as designing and interpreting spatial function for meaning and cues (Baehr, 2007; Messaris & Moriarity, 2005). In this electronic environment, Web designers are required to understand how best to present words, images, and sounds for effective Web communication. In addition to keeping abreast of technology developments and how Web visitors use technology, Web designers can inform their practice by drawing upon proven principles in cognitive learning theory and visual communication theory that apply across different media.

Cognitive science is the study of how the human behaviors of perception, learning, and memory affect information processing (Head, 1999). Cognitive learning theory and visual communication theory embrace the Gestalt principles of organization that describe how learners recognize and remember (Bernhardt, 2004; Head, 1999; Mullett, 1995). These theories relate specifically to – and should inform – Web design practices to focus and guide Web users' attention and help Web users achieve a task (Head, 1999; Mullet, 1995; Raskin, 2000).

To examine if Web design instruction historically has been situated in complex human-computer interactions, the following research questions guided this study:

- How have Web design rules evolved since the mid-1990s and what are the influencing factors (for example, technological development, content management practices, Web 2.0 tools, multimodal communication practices)?
- Does Web design instruction through textbooks and mainstream publications (like *Web Design for Dummies*) simply dictate rules or does it encourage designers to think critically about the design decisions being made, to think about the *why* behind design choices?
- If designers are encouraged to think critically about design choices, are the guiding principles based on cognitive learning or visual communication theories or situated in best practices?

Methodology

For purposes of this study, the term *Web design* included both designing the layout of Web pages as well as the

design of information. Both are important – and have been recognized as such throughout the last 20 years – because good Web design:

- can "bring [Web visitors] inside and, once they are in, [try] not to confuse or frustrate them" (Black & Elder, 1997, p. 177).
- "creates visual logic and seeks optimal balance between visual sensation and graphic information" (Lynch & Horton, 1999, p. 53).
- "is a combination of the experience, surprise and feeling good on the one hand, and clear orientation, functionality, and shopability on the other" (Gerdes & Nachtwey, 2000, p. 35).
- can "make sense of data and shape information on a matter to a purpose" (Waters, 2003, p. 11).
- "captures attention," "controls eye movement," "conveys information," and "evokes emotion" (Golombisky & Hagen, 2010, p. 6).
- "brings order from chaos" and "reduces the effort of reading" (White, 2011, p. 3).

Selection of Texts

This study focused on a sampling of textbooks and general-interest publications on Web design over the last 20 years. The initial reading list was collected using key-term searches of Web design at Google Scholar, Amazon.com and two Minnesota state college and university libraries as well as a physical visit to the Web design section at Barnes and Noble. Further, text recommendations made by other scholars were considered.

To narrow the study's scope and initial results of book selection, book titles that included the words *Web, Website,* and/or *design* were selected. Book titles that focused on coding (for example, HTML, CSS, Java, and JQuery) or Web development software (for example, Dreamweaver, Flash, and so forth) were excluded.

From the initial reading list, a total of 40 books (see Appendix A) were selected to represent each of the following five-year periods:

- 1995 to 1999
- 2000 to 2004
- 2005 to 2009
- 2010 to 2014

Content Analysis of Web Design Instruction

Content Analysis & Coding

Books were analyzed using content analysis in three steps. The first step was to identify common word units related to Web design that were "on the surface and easily observable" (Potter & Levine-Donnerstein, 1999, p. 259). The initial schema of word units was divided into four categories, as shown in Figure 1. Each of these word units was further broken down to related word units that also were easily observable. For example, the term *fonts* was expanded to include *type, size,* and *color. Navigation* was expanded to include *buttons, hyperlinks, URLs,* and *navigation bar.*

The second step was the implementation of a protocol based on the research questions. The following protocol was used:

1. Did the text include the Web design word unit?
2. If yes, did the text give a rule relating to the word unit using command language?
3. If yes, was the rule based on one or more of the following guiding principles:
    a. Technical specification – for example, use standard system fonts to minimize changes to Web page appearance across platforms and devices.
    b. Grounded in theory – for example, use serif fonts for easier reading because the tails allow readers to follow and predict letter shape.
    c. Situated in practice – for example, use a font like Wild West to add pizzazz to your page.
4. Did the text provide a visual example of the rule in action?
5. Did the text provide comparative visual examples?

The third step of the content analysis was identifying word units related to cognitive learning and visual communication theories. In general, identifying technical rules was easily observable. Conversely, determining whether or not rules were grounded in theory or situated in practice often required drawing upon *latent content* – or that which is not easily observable – to identify *patterns* or *judge the meaning* in the content (Potter & Levine-Donnerstein, 1999, p. 259). A word like *alignment*, for example, may have been identified as technology, practice, or theory depending on the context of use:

- how to code alignment in a table cell or on Web page,
- a recommendation to center text for visual appeal, or
- left-justifying all text for easier reading and page flow.

Results

Overall, Web design texts didn't simply prescribe rules. Instead, all texts encouraged designers to think critically about audiences. Changing technology clearly played a key role in the evolution of Web design instruction. Finally, Web design instruction included some level of reference to cognitive learning theory or visual communication theory.

Audience Awareness

All 40 texts examined in the study addressed audience considerations when designing a Website. Discussions of audience included awareness of the Web user's technology and skill level, behavior with technology,

Page design	Information design	Interactivity design	Technical specs
Color	Audience	Organization	Accessibility
Fonts	Purpose	Navigation	Device compatibility
Graphics	Background	Interactivity	Browser compatibility
Audio/video	Structure		Page size
Arrangement/layout			Markup language
Text			

Figure 1. Initial Schema of Common Web Design Word Units and Design Categories.

Note: Each of these word units was further broken down into additional word units that were easily identifiable on the surface of the text. For example, font was further divided into type, size, and color.

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method of seeking information or reading on the Web, purpose for visiting a Website, and tasks to complete on a Website. That said, the amount of space dedicated to the topic of audience varied significantly from book to book and time period to time period; some books merely mention audience occasionally, others discuss audience throughout each chapter, and others devote entire chapters to audience.

Technology Use

From 1995 to 1999, the predominant discussion regarding Website users was based on the technology available to them. More specifically, texts discussed Web-safe colors, compatible font usage and size, modem speed, download speed, and user control of the experience as it related to technology.

During that time frame, modem speed and page load time surfaced in all discussions of graphics and use of audio or video. Designers were advised there was no acceptable delay (Black & Elder, 1997) or that a Web page should take less than 10 seconds to load (Lynch & Horton, 1999). When typical modem speeds doubled from 28k of information transfer per second to 56k, designers were warned, "Don't get spoiled" (Williams & Tollett, 1998, p. 18).

Early texts also recommended involving the target audience in Website planning and development with a few exceptions. One text suggested getting feedback on Website design from coworkers and friends and to simply "Play around a bit" (Toyer, 1999, p. 101). Another text encouraged designers to judge the design based on personal preference: "What do you like? What don't you like?" (Durie & Flanagan, 1999, p. 130).

Finally, Web designers were encouraged to build multiple Website versions to account for browser compatibility as well as to accommodate users who prefer to view a text-only site (Tapley, 1999). One author pined for a day when " . . . we have the ability to design the environment through which the Website is viewed. When designers can determine whether you will experience a site using one or more windows, and whether you will experience sound or video" (Gassaway, 1997, p. 55). That day did not come to pass as Web design practice entered the 2000s and designers were encouraged to "make it easy" for Web audiences by "stay[ing] with their skill level and technology level" (Stauffer, 2002, p. 32).

The early 2000s ushered in the era of the end-user with a focus on usability (Brinck, Gergle, & Wood, 2002; Donnelly, 2001; Galitz, 2002; Kentie, 2002; Krug, 2000; Nielsen, 2000; Spool, 1999; Stauffer, 2002), user-centered design (Cato, 2001; Donnelly, 2001), and user experience (Brinck et al., 2002; Galitz, 2002). While Web design instruction still referenced page load time or browser compatibility, the focus shifted to how Web users interact with technology, specifically: their understanding, expectations, and comfort level with Web technology, behavior patterns, and how they use Web technology to complete tasks. An in-depth discussion of these approaches to Web design is outside the scope of this study; however, it is a noticeable shift based simply on the titles of books published after 2000.

Finally, the Website design convention that was situated in the best practices of newspaper culture – designing *above the fold* – held strong as a design rule throughout the 20-year time period. While many texts cautioned against asking Web users to scroll horizontally or vertically, designing *above the fold* was specifically mentioned in 25% of texts and as late as 2014 (McManus).

Accessibility and Inclusive Design

Only 28 of the 40 books addressed accessibility and how individuals with varying physical or cognitive abilities engage with a Website. For example, two books addressed the use of color as it relates to color blindness (Eisenberg & Eisenberg, 2006; Golombisky & Hagen, 2010). Similarly, four books discussed the use of *alt tags* for accessibility as well as for Website users who prefer text-only viewing of a Web page (Lynch & Horton, 1999; Flanagan, 1999; Baehr, 2007; Macdonald, 2009).

Several books offered complete chapters on accessibility or accessibility design tips peppered throughout the text (Nielsen, 2000; Brink, Gergle, & Wood, 2002; Galitz, 2002; Stauffer 2002). Comprehensive accessibility guidelines were offered by Todd Stauffer (2002), who addressed voice commands, speak-aloud content, aural props, and the ability for audiences to cue the read-aloud function with pauses, speech rate, and voice preferences. David Whitbread (2009) offered a broader definition of accessibility when he discussed how *design exclusion* impacts older adults, people with disabilities as well as "economically vulnerable" groups who are affected by changing technology (p. 34).

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Cognitive Learning and Visual Communication Theories

In his 2002 book *Fresh Styles for Web Designers: Eye Candy from the Underground*, Curt Cloninger railed against the usability movement – and specific scholars Jakob Nielsen and Jared Spool – for facilitating a "generation of safe, bland, copycat Websites that are about as engaging as a book on usability testing methodologies" (p. 4). He explicitly addressed cognitive learning theory and visual communication theory by turning it on its head and recommending designers "exploit expectations" through "intentional misalignment," "sloppy boundaries," and a "nomadic" navigation bar (p. 102). To be fair, Cloninger also recommended designers ensure these approaches are appropriate for the audience and purpose of the Website. While Cloninger's statements were an anomaly in the texts, discussion of contrast, emphasis, consistency, and alignment are considered essential to the effectiveness of a Web page and the Web user experience.

As noted previously, Web page design serves a dual function: to provide a visually stimulating design and to order the flow of information. Both functions can be achieved through typographical cueing techniques such as contrast, consistency, alignment, and proximity that focus user attention and allow for predictability, learnability, and scanning of information (Mullett, 1995; Head, 1999; Raskin, 2000; Kostelnick & Hassett, 2003).

Of the 40 texts, most included theory-based word units as shown in Figure 2. *Contrast* and *emphasis* were the most common word units with mentions in 33 of
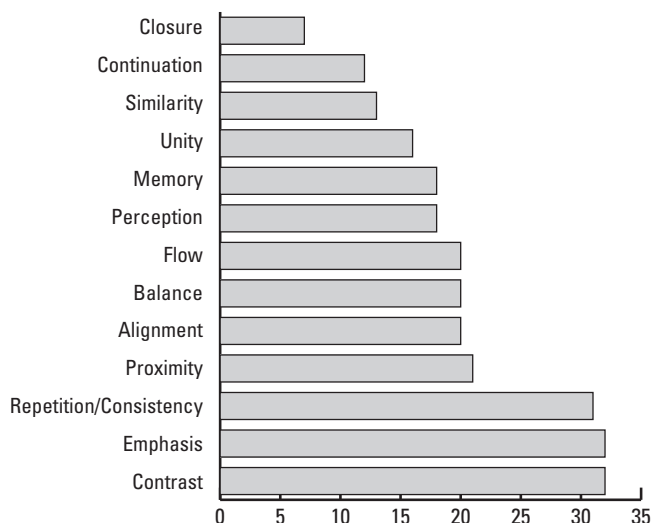
the texts. *Repetition* and *consistency* collectively had 31 mentions. Approximately half of the texts mentioned *proximity, alignment, balance,* and *flow.*

The frequent appearance of these theory-based word units in Web design texts seems like a positive attribute. Coupled with discussion about technological capabilities and audience, one might interpret this to mean that Web design instruction does a solid job of situating design practices in theory, technology, and the complex situations in which the Web user operates. The treatment of the theory-based word unit – that is, the amount of explanation or depth of discussion about the word unit – varies greatly from text to text. Three treatments of the word units were evident in the Web design books: (1) written explanation of the design convention, (2) explanation of the theory-based word unit with visual examples of the design convention, and (3) dedicated chapters to theory-based design.

To illustrate these three treatments, the sections below provide examples of how the theory-based word *contrast* was treated in several texts. While these examples focus on that single word unit, similar treatment was found for the remaining words on the list shown in figure 2.

Treatment 1: Written Explanation of the Design Convention

The first example of a written explanation includes *contrast* as part of a larger discussion on readability. Donnelly (2001) merely mentioned *contrast* in a list of design concepts:

> " . . . guidelines to help make text easier to read on a screen, including:
>
> - Using negative contrast (for example, black text on white background);
> - Using mixed case and a well-designed screen font;
> - Having a good balance of text and white space;
> - Formatting the text to have a comfortable line length of 10-12 words per line or 40-60 characters;
> - Making the text left aligned;
> - Using a sans serif typeface;
> - Having non-justified text" (p. 93)

Other texts provided slightly more explanation of the word unit and how it aids the user experience. For instance, Brinck (2002) explained contrast as a key to interpreting overall Web page structure and organization.

Figure 2. Theory-Based Word Units That Emerged in Web Design Texts

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"Contrast is critical to overall balance and structure, differentiating elements within a display and controlling the users' gaze . . . A full page of text will be viewed as a solid mass with no clues as to how the user should proceed, while an overly graphic page containing too many highly contrasted elements will disrupt the ability of the user to find the relevant content." (p. 188)

Similarly, Morris and Hinrichs (1996) included a mention of contrast in a callout (figure 3) accompanied by the following text to explain how the eye views color:

"Dark red on a dark blue background is not very readable. Neither are some combinations of the same color. Blue is the most notable culprit here. There are fewer blue color receptors in the center of the eye than other color receptors. Blue color variations are harder to distinguish and require a more dramatic difference. Another color contributing to this problem is the fact that monitors have some variation in how they display color." (p. 174)
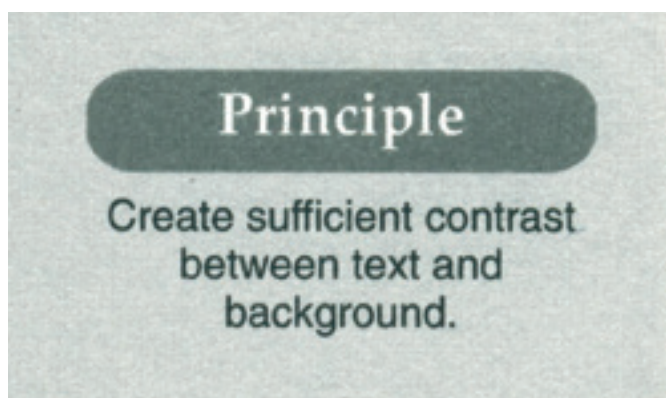

Figure 4. In *Web Concept & Design: A Comprehensive Guide for Creating Effective Web Sites*, Contrast Is Explained as it Relates to the Poor Readability of a Font Color on a Busy Background. The Colored Screenshot Illustrates the Poor Readability (Waters, 1996, p. 115).
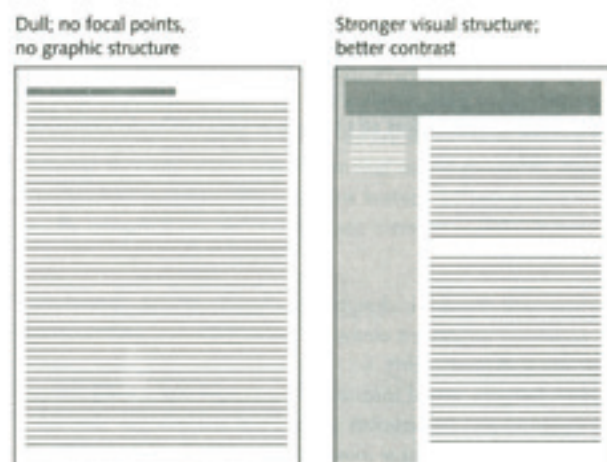
Figure 5: In *Web Style Guide: Basic Design Principles for Creating Web Sites*, Contrast Is Explained as a Principle for Attracting the Eye and Guiding the Web User Through the Organizational Structure of the Page. Comparative Layouts Are Included (Lynch & Horton, 1999, p. 54).

Figure 3. The Principle of Contrast Is Mentioned in a Callout (Morris & Hinrichs, 1996, p. 174).

Treatment 2: Explanation with Visual Examples
Many texts coupled written explanations of theory-based word units with visual examples of the design conventions in action, as seen in Figures 4, 5, 6 (a and b), and 7 below.

Treatment 3: Dedicated Chapter
Finally, several books dedicated entire chapters to cognitive learning theory and visual communication theory. The chapter titles signal their theory-based content:

- Cognitive design (Morris & Hinrichs, 1996)
- Design basics (Wang, 2004)
- Basic design principles for non-designers (Williams & Tollett, 2005)
- Visual design (Baehr, 2007)
- Memory & perception (Galitz, 2002)
- Mini art school: the elements & principles of design (Golombisky & Hagen, 2010)

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Figure 6A And 6B: In *White Space Is Not Your Enemy: A Beginner's Guide to Communicating Visually Through Graphic, Web & Multimedia Design*, the Word Unit Contrast Is Shown Using Comparative Examples of Colored Text on Colored Backgrounds. In Addition, the Authors Provide a Layout with the Rule, "for Contrast, Pair Opposite (Complementary) Colors on the Color Wheel" (Golombisky & Hagen, 2010, p. 128, 130).

All of these examples demonstrate the myriad approaches in which cognitive learning theory and visual communication theory are presented in Web design books to guide critical thinking and to inform practice. This inconsistent approach suggests further study might be needed to better understand which approach is more effective in communicating the theories as a whole as well as their application in Web design.

Discussion and Future Research

The research questions guiding this study asked:

- How have Web design rules evolved since the mid-1990s and what are the influencing factors?
- Does Web design instruction through textbooks and mainstream publications simply dictate rules or does it encourage designers to think critically about the design decisions being made, to think about the *why* behind design choices?
- If designers are encouraged to think critically about design choices, are the guiding principles based on cognitive learning or visual communication theories or situated in best practices?

Clearly, technology has been an influencing factor throughout the last 20 years of Web design instruction. The content analysis of this study suggests Web design instruction has encouraged Web designers to

Figure 7. In *The Non-Designer's Web Book: An Easy Guide to Creating, Designing, and Posting Your Own Web Site*, the Author Pair the Word Units *Contrast* and *Focal Point* in These Comparative Examples that Illustrate Two Points. First, the Authors Illustrate the Readability Between Text and Background. Second, the Authors Illustrate Drawing Attention to Information with Contrast in the Size and Shape of Elements (Williams & Tollett, 1998, p. 119).

think critically about technology shifts as well as their audiences' skill and use of technology. Further, Web design instruction has incorporated design principles based on cognitive learning theory as well as visual communication theory. Some of this theory has been embedded on a surface-level mention within Web design texts while some has been grounded deeply in the text.

The various treatments of theory suggests further study to better understand which approach is more effective in communicating the theories as a whole as well as their application in Web design.

For scholars, practitioners, and educators, the questions become:

- Are all three treatments equally effective in presenting Web design instruction that encourages critical thinking about and understanding of audience and technology?

- Is there a best way or – as Albers (2013) suggested – do we risk encouraging the *Cargo Cult* mentality by "reducing complex situations to simple situations" that "apply across all situations" (p. 59)?

Future research should focus on testing the three types of treatments and could include usability testing of the Web design instruction coupled with Web credibility testing on Web pages designed with the varying treatments of instruction. That research is increasingly important in the Web's ever-changing, dynamic environment.

Web design and the Web user experience have quickly evolved and changed in ways that traditional print never did. Understanding user expectations of design conventions for this ever-changing medium is ripe with challenges and opportunities. Consider this: a 4-year-old and an 80-year-old can engage with a traditional book in much the same way. They can open and close the covers, turn the pages, and review the content. That same 4-year-old and 80-year-old might engage with a Web page in radically different ways. The younger of the two might be on a mobile phone in her car seat, swiping, pinching, expanding, tapping, and selecting content with ease while the 80-year-old might be on a desktop computer in the public library trying to identify what to click with her mouse and how to navigate the page. These two extremes represent the spectrum of the diverse audiences that are being designed for.

We know that cognitive learning theory and visual communication theory call for consistency, repetition, and similarity for Web users to learn, remember, and recognize information and organization on the Web. If we refer back to our 4-year-old and 80-year-old, the younger of the two is conditioned to tap or swipe on anything and everything whether the element indicates it's a responsive element or not. The older Web user, on the other hand, may have been conditioned to identify responsive elements by the blue underlining of a hyperlink, the words *click here,* and buttons that actually look "pushable." The challenge is for Web designers to satisfy both of these audience extremes and for Web design instruction to facilitate careful consideration of these audiences as times change.

In *Shaping Information: The Rhetoric of Visual Conventions,* Kostelnick and Hassett (2003) posited that to understand or change conventions we must consider several factors:

- Discourse communities,
- Rhetorical factors, like document types and their respective cues, and
- External, practical factors like technology (p. 82-83).

The two individuals in the example demonstrate the discourse communities at play. As technology continues to evolve at breakneck speed, the challenge is to adapt and understand which conventions to keep and which are no longer relevant. The answer will be based on the communities that are engaging with the Web (as well as those not engaging with the Web due to barriers or personal choice). Identifying discourse communities will help practitioners understand the rhetorical factors – specifically the document types and visual cues expected for engagement – that drive successful interaction with the Web. In other words, knowing what to keep and what to discard requires a discussion of audience; knowing what to keep and what to discard can be a benefit and be a detriment to novices and expert users, as Mullet points out. Providing "*visual affordances* (things that suggest interaction possibilities) reminds the user of its availability as well as its operation" (Mullet, 1995, p. 25).

Finally, as content management systems like WordPress, Joomla, Drupal, Wix, and bludomain offer out-of-the-box Website development and maintenance complete with templates and code, the potential for understanding complex human interaction diminishes in the ease of use. Novice and professional Web designers can add content and go live with a Website rather quickly. A quick review of the 2013 edition of *WordPress Web Design for Dummies* (Sabin-Wilson) shows that *alignment* and *contrast* are the only theory-based words found in the book; however, they are mentioned only as part of directions to complete a technical task.

When Web design is effective, it goes unnoticed. In fact, ". . . the best designs are ones that users never give a second thought about. They describe this quality as *invisibility*" (Head, 1999, p. 4). For Web designers, however, achieving this *invisibility* takes a lot of thought.

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Appendix: Sampling of Web Design Books from 1995 To 2014 for Content Analysis

1995 to 1999 (11 books)

Web concept & design: A comprehensive guide for creating effective Web sites (Waters, 1996)

Web page design: A different multimedia (Morris & Hinrichs, 1996)

Killer Web design: NetObjects Fusion (Gassaway, 1997)

Web sites that work (Black & Elder, 1997)

Web navigation: Designing the user experience (Fleming & Koman, 1998)

Creating a Web site: How to build a Web site in a weekend and keep it in good shape (Durie & Flanagan, 1999)

Web design in a nutshell: A desktop quick reference (Niederst Robbins, 1999)

Web site usability: A designer's guide (Spool, 1999)

Web style guide: Basic design principles for creating Web sites (Lynch & Horton, 1999)

Who's afraid of Web page design? (Tapley, 1999)

Build a Web site: The lazy way (Toyer, 1999)

2000 to 2004 (11 books)

Designing for the Web (Nielsen, 2000)

Web design: The complete reference (Powell, 2000)

Designing easy-to-use Websites: A hands-on approach to structuring successful Websites (Donnelly, 2001)

User-centered Web design (Cato, 2001)

Absolute beginner's guide to creating Web pages (Stauffer, 2002)

Designing Web sites that work (Brinck, Gergle, & Wood, 2002)

The essential guide to user interface design: An introduction to GUI design principles and techniques (Galitz, 2002)

Fresh styles for Web designers: Eye candy from the underground (Cloninger, 2002)

Web design tools and techniques (Kentie, 2002)

The real business of Web design (Waters, 2003)

An introduction to Web design and programming (Wang, 2004)

2005 to 2009 (9 books)

Handbook of human factors in Web design (Proctor & Vu, 2005)

The non-designer's Web book: An easy guide to creating, designing, and posting your own Web site (Williams & Tollett, 2005)

Balanced Website design: Optimizing aesthetics, usability, and purpose (Lawrence & Tavakol, 2007)

Design and documentation: Information architecture for the World Wide Web (Morville & Rosenfeld, 2007)

Web Development: A Visual-Spatial Approach (Baehr, 2007)

The complete idiot's guide to creating a Website (McFedries, 2008)

Visual design for the modern Web (McIntire, 2008)

The design manual (Whitbread, 2009)

Million dollar Website: Simple steps to help you compete with the big boys – even on a small business budget (Culwell, 2009)

2010 to 2014 (9 books)

White space is not your enemy: A beginner's guide to communicating visually through graphic, Web & multimedia design (Golombisky & Hagen, 2010)

Creating a Website: The missing manual (MacDonald, 2011)

The elements of user experience: User-centered design for the Web and beyond (Garrett, 2011)

Web design demystified (Willard, 2011)

Web design for dummies (Lopuck, 2012)

Build a Website for free (Bell, 2013)

The creative person's Website builder (Moore, 2013)

WordPress Web design for dummies (Sabin-Wilson, 2013)

Web design in easy steps (McManus, 2014)

Technically Speaking: Preservice Teachers' Perspectives and Attitudes on the Use of Technology

David Magolis and Michael Homishak

Abstract

Purpose: Computer-based presentations are the expected form of instruction in education; however, little knowledge exists about perspectives and attitudes on the use of technology and technical communication in the classroom through preservice teachers' experiences. Therefore, the focus in our explorative study is to understand these perspectives and attitudes to aid in the development of technology and technical communication curriculums for preservice teachers.

Method: A phenomenological research approach was used to interview ten preservice teachers to explore the question, "what is the nature of preservice teachers' experiences with technology and technical communication in the classroom?"

Results: Preservice teachers' educational experiences with technology and technical communication show a strong preference for using Microsoft PowerPoint to convey course content. However, a major theme from their perspectives and attitudes was negative toward formal PowerPoint communication training. Furthermore, participants stressed the over reliance on PowerPoint in the classroom; they desired more creativity and better ways of communicating course content.

Conclusion: This study provides evidence worthy of serious reflection on the reality that there is a significant issue in teacher education curriculum today and the ineffective use and instruction of technology and technical communication in educational settings.

Keywords: instructional, technologies, preservice, teachers, training

Practitioner's Takeaway

- Preservice teachers need proper technology and technical communication training and are not currently receiving it in their teacher preparation programs.
- A technology curriculum that includes technical communication needs to be developed for preservice teachers.

- Instead of sufficient use of technology preservice teachers note an over reliance of technology instead of subject mastery.
- The scope of instructional technologies used in the classroom are limited to mostly PowerPoint.

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Introduction

In the 1960s, computers began to be used in schools, mainly for administrative purposes at first. In the years following, vocational programs began teaching computer maintenance and a limited amount of computer-aided instruction was used in the classroom. This marked the first period of time in which computers were used in schools (Schifter, 2008). Nearly a decade later, in 1976, Apple released the first computer designed for personal use. Subsequently, educational institutions from elementary schools to universities began to implement technology even further into the curriculum. Since this introduction to more integrated educational technology, computers and other technologies have become increasingly prevalent in schools and learning environments. Rapid advancements in technology allow new tools to integrate themselves into all facets of learning, and this integration is occurring as fast as advancements are being made. The latest hardware and software has become a staple of use at home, in schools, and in the workplace. With learning and working environments experiencing a shift toward more student-centered, differentiation, and multimedia concentrated approaches, successful integration of communication technology in the classroom is imperative. Both schools and businesses are using the latest technologies daily to complete tasks and objectives more efficiently and accurately (Shelly, Gunter, & Gunter, 2010). Since the advent of computer communication technologies in the classroom, the effect of that technical communication in the classroom has steadily increased in importance.

To keep up with the perpetually growing dependence on new technology in everyday life, students must be exposed to and familiarized with new technology in learning environments. Several studies have shown that the effective use of technology in the classroom has positive effects on learning and attitudes toward learning (Lee & Spires, 2009; Olalere & Olufemi, 2010). To effectively use and implement current technology, preservice teachers must have sufficient instruction. It comes as no surprise that the majority of institutions, which educate future teachers, are found to include technology and computer-related courses to prepare teachers to use these resources in the classroom (Yildirim, 2000). Between 1999 and 2004, the Preparing Tomorrow's Teachers to Use Technology program spent over 337 million dollars assisting teacher preparation programs in effectively integrating technology training. Along with this, a United States Department of Education report (Smerdon, 2000) noted that "teachers' preparation and training to use education technology is a key factor to consider when examining their use of computers and the internet for instructional purposes" (p. iii).

A study by Kay (2006) noted that meaningful technology has a significant positive effect on learning, and preservice teacher education is a natural setting to begin this education. Meaningful technology communication use must be present in modern day classrooms to adequately prepare students for future usage. As noted by Teo (2008), teachers are "key drivers who play crucial roles in technology integration in the schools and classrooms. It is important for them to possess positive computer attitudes since attitudes have been found to be linked to usage and intention to use, variables that determine successful technology integration in education" (p. 421).

Preservice teachers are aware that technology integration will become a regular aspect of their daily classroom lessons. Ideally, preservice teachers will have had the appropriate education on technology integration and technical communication to be able to seamlessly integrate each into an educational setting in a way that will enrich students' learning and provide new, meaningful activities. However, Milken Exchange on Education Technology and the International Society for Technology state "in general, teacher-training programs do not provide future teachers with the kinds of experiences necessary to prepare them to use technology effectively in their classrooms" (Milken Exchange on Education Technology, 1999, p. i). Therefore, more rigorous research needs to examine how technology communication is being used and the attitudes of the preservice teachers. Kay (2006) explains that, "more rigorous and comprehensive research is needed to fully understand and evaluate the effect of key technology strategies in preservice teacher education" (p. 385). The research question explored in this study is, "what is the nature of preservice teachers' experience with technology in the classroom?" The goal of this research is to explore preservice teachers' educational experiences with technology, their attitudes toward formal technology training, and attitudes toward technology communication in the classroom.

Review of Relevant Literature

The significance of this research lies upon the gap between technical communication education of preservice teachers and their attitudes and eventual implementation of technology into the classroom. Lam (2006) found that attitudes and perceptions of technology weighed heavily on teachers' decisions regarding technology integration. Teachers who did not use technology as regularly in the classroom stated that it was due to their personal perception of technology's impact on student needs, their prior training with technology integration, administrators' attitudes toward technology use, and their perceived skill and knowledge with technology. Another study by Teo, Lee, and Chai (2008) assessed teachers' perceptions on technology use. This study found significant correlations between perceived usefulness and effectiveness of technology with teachers' attitudes concerning technology use. They also noted that teachers' attitudes toward technology play a critical role in their actual implementation of technology into the classroom, and positive attitudes regarding technology are correlated to more successful technology use in the classroom.

Just because technology is used for teacher preparation in an institution does not mean that it is automatically effective. A study by DeGennaro (2010) notes that technology classes taught separate from regular education classes are ineffective, as it insinuates the notion that technology and education are separate disciplines. DeGennaro stresses that this disconnect in the two subjects leads to improper modeling for preservice teachers. The study suggests an integration of the two disciplines throughout the whole of training. A question to be asked is how it can be known if technology integration in preservice teacher training is effective. This will assist in the design of meaningful technology education in teacher preparation programs.

A way to determine how effective technology education is in preservice teacher training is to assess attitudes and perceptions of technology in preservice teachers. It is interesting to note the difference between implementation of technology in an educational setting, and the attitudes toward technology use in these types of settings. A study assessing the use of technology in higher education found that students agree that it does not matter as much what kind of technology is used, rather how well the instructor can use it (Kyei-Blankson,

Keengwe, & Blankson, 2009). In the study, one student stated that improper technology use due to low competency or overuse is actually "detrimental to students' learning" (Kyei-Blankson, Keengwe, & Blankson, 2009). Noting this, it is imperative that educators have the knowledge to effectively implement technology into the classroom, and preservice teachers must also be as knowledgeable so they can provide the same effective technology integration to their future classrooms. They must be competent enough to not only navigate new programs and networks, but also to use this technology in a way that it will supplement learning (Lee, & Spires, 2009). This technical communication competency from training is incredibly important to preservice teachers' knowledge of technology as well as their confidence and frequency of use (Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010).

According to Mackiewicz (2007), "since the publication of Tufte's *The Cognitive Style of PowerPoint*, academic and industry experts in technical communication have intensified their efforts to develop guidelines for creating effective presentations" (p.149). This leads to the question, how has the education sector intensified its efforts to develop technical communication guidelines? Accordingly, what are preservice teachers' attitudes and experiences regarding technical communication used in a classroom? This study does not include questions guiding participants to specific types of technical communication, but PowerPoint was inevitably mentioned during every interview, especially in regards to training and misuse. The technical communications literature explores both the theoretical (see for example, Doumont, 2005; Farkas, 2005; Manning & Aware, 2006; Gross & Harmon, 2009) and empirical studies (Alley & Neely, 2005; Mackiewicz, 2007) which helps guide educators' technical communication training. However, research on PowerPoint use in the classroom has yielded mixed findings (Berk, 2011). Studies have shown that students generally perceive PowerPoint as having a positive effect on the learning experience. Studies have stated that PowerPoint provides structure to lessons, improving ability to organize lessons and present clear information (Susskind, 2008). It is also noted in a study by Craig and Amernic (2006), that students positively perceive PowerPoint because of its novelty and availability for printed copies. PowerPoint has also been shown to increase the perception of an instructor's

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credibility and knowledge. A study by Atkins-Sayre *et al.* (1998) noted that when instructors used presentation graphics such as PowerPoint, students not only were more interested in the lesson, but also believed the instructor's delivery was enhanced and their credibility increased.

Although there is research showcasing the benefits of PowerPoint software, particularly regarding student efficacy, there is also research which shows that PowerPoint is not truly effective. According to a study by Craig and Amernic (2006), there is little empirical evidence on the actual effectiveness of PowerPoint in learning, and previous studies on this topic show there is no significant improvement in learning and grades due to teaching with PowerPoint. Susskind (2008) cites several studies that have found an increase in student performance after being taught with PowerPoint, but also many studies that have shown no student improvement after implementation of PowerPoint. Craig and Amernic also list many studies that did not show a significant increase in student performance after using multimedia presentations.

Although there is concern about the misuse of technology in the classroom, its use continues to remain high. The increased use of technology can also lead to increased reliance on technology. A study done by Grunwald Associates for PBS in 2010 indicates that teachers are becoming increasingly reliant on technical communication in the classroom. This survey found that the use of the internet, portable computers, smart boards, and online communities were all trends in technical communication education that teachers use and feel are good educational tools. Therefore, it is imperative that we study preservice teachers' perceptions of technology and technical communication training in teacher preparation programs.

Foundations

The purpose of this multi-perspective phenomenological study was to explore the educational experiences and perspectives that preservice teachers have with technology and technical communication. Through the use of semi-structured interviews and participant observation, the study aimed to better understand and give voice to preservice teachers' use of technology, as well as explore their attitudes toward technology use in the classroom. This research will provide insight into the training and preparation of preservice teachers'

technical communication, for this is a growing aspect of the teacher education curriculum. To date, little research exists that gathered perspectives of preservice attitudes and uses of technology.

Kay (2006) comprehensively reviewed the literature on strategies used to incorporate technology into preservice education. Kay explains that "there is clearly a role for qualitative research in assessing the effectiveness of specific technology strategies" (p. 389). One method is to "follow more rigorous protocols in collecting and analyzing qualitative data" (p. 389). Our goal was to rigorously collect and analyze the participant interviews.

DeGennaro (2010) notes that qualitative research is important to effectively study socialized activity. This literature states that data collected via surveys reduces the meaning of participation. With quantitative studies using data-collecting methods such as surveys, participants are directed to a series of predetermined responses. Afzal (2006) notes that overuse of surveys will only "create snapshots of behavior" that do not provide a deeper understanding of social situations (p. 23). It is stated that ethnographic strategies can lead to a deeper understanding of particular situations (van Manen, 1998). By using qualitative research and interview methods, active participation and self-directed responses are promoted. These non-guided answers will lead to the access of more authentic, in depth attitudes and perceptions. Maxwell (2004) states that qualitative analysis can lead to understanding of mechanisms of association, which is more complicated than finding the association between two variables. Qualitative research enabled us to investigate a more complex thought process of our study group, with the goal of finding a deeper understanding of attitudes and perceptions of technology and technical communication in education. Therefore, we asked the question: what are preservice teachers' perspectives and attitudes on the use of technology in the classroom? What follows is a study that explores preservice teachers' educational experiences with technology, their attitudes toward formal technology training and attitudes toward technology utilization in the classroom.

Research Questions

Guiding questions for the study:

1. What is the nature of preservice teachers' educational experiences with technology and technical communication?

2. What are preservice teachers' attitudes toward their formal technology training?

3. What are preservice teachers' attitudes toward technology and technical communication in the classroom?

4. From their perspective, are preservice teachers receiving enough training on the latest teaching and communication technologies?

Research Method

Research related to preservice teachers and technology has made great strides in the past few years. However, there is very little that explores technology from preservice teachers' own vantage points. A phenomenological research method provides first-hand insight into preservice teachers' attitudes and perspectives on technology in the classroom. "Research methods are plans used in the pursuit of knowledge. They are outlines of investigative journeys, laying out previously developed paths, which, if followed by researchers, are supposed to lead to valid knowledge" (Polkinghorne, 1989, p. 41). A phenomenological research method (Moustakas, 1994) was employed to obtain preservice teachers' perspectives and attitudes on technology. "Phenomenology does not produce empirical or theoretical observations or accounts. Instead, it offers accounts of experienced space, time, body, and human relation as we live them" (Van Manen, 1998, p.184). Seidman's (2006) interview protocol method was utilized as the primary data collection approach. The interview method included three in-depth, semi-structured, and iterative interviews, averaging one hour in duration, with ten secondary education preservice teachers that teach in rural areas and in school districts that educate approximately 2,000 students. Our goal was to interview each preservice teacher on three separate occasions, each of which were audio recorded. The first interview asked participants to share as much as possible about educational experiences with technology and technical communication. The second interview focused on eliciting the details of the lived those educational experiences. The final interview provided a reflection on the meaning the participant attaches to the technology and technical communication experiences. After the interviews, the audio was transcribed verbatim and subsequently analyzed for interpretive themes.

The data was analyzed following the Dahlberg *et al.* (2008) phenomenological approach. Two researchers individually read the whole data set, which included all transcripts and field notes, along with memos generated from the interviews. After acquiring a firm comprehension of the entire data set, the researchers read each interview and brief memos were generated for the individual interviews. The interviews were read a third time before the interviews were coded line-by-line. Line-by-line coding generated meaning units from the participants' statements concerning the phenomenon. Those meaning units were then discussed and analyzed by the researchers during five separate periods to identify common themes. A total of eight meaning units were identified and clustered (based upon similarities) into general themes. A theme captures a unique aspect of the data connected to the research question and represents some level of patterned response or meaning within the data set (Braun & Clark, 2006). The researchers continued to analyze the transcripts, memos and field notes until no more themes were discovered and the data reached a point of saturation (that is, no new additional insights were generated). Once the codes were examined across all interviews, themes emerged to form the basis of the findings. The following are the resulting themes representing the essence of the participants' lived experiences. The themed responses from the analysis phase are below. Each preservice teacher's profile is given below.

Participants' Profiles

Table 1 provides an overview of the participants' characteristics.

Participant 1 was a female early childhood education major. At the time of the interview, she was a junior at the college she attended. She stated that she has been using computers and technology since she was approximately 8 years old. She uses computers, cell phones, and the Internet on a daily basis.

Participant 2 was a female secondary education Spanish major. At the time of the interview, she was a senior at the college she attended. She stated that she has been using computers and technology since she was approximately ten years old. She mainly uses an iPhone daily.

Participant 3 was a female early childhood education major. At the time of the interview, she was a junior at the college she attended. She stated that she has been using technology for "many years," but did not

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note at what age she began using technology. She uses computers and smartphones on a daily basis.

Participant 4 was a male secondary education English major. At the time of the interview, he was a sophomore at the college he attended. He stated that he has been using computers and technology since he was approximately thirteen years old. He uses iPods, computers, and cell phones on a daily basis.

Participant 5 was a female secondary education English major. At the time of the interview, she was a sophomore at the college she attended. When asked

about how long she has been using computers and technology, she stated that she has used them "forever, basically." She uses the Internet, computers, and gaming devices on a daily basis.

Participant 6 was a male secondary education English major. At the time of the interview, he was a senior at the college he attended. He stated that he has been using computers and technology since middle school. He stated that he uses computers on a daily basis.

Participant 7 was a female early childhood education major. At the time of the interview, she was a junior at

Table 1. Characteristics of the Participants

Year		Major		History of technology use		What is used daily	
Response	**#**	**Response**	**#**	**Response**	**#**	**Response**	**#**
Freshman	0	Early childhood education	4	Used since before high school	8	Computer	7
Sophomore	2	Secondary education, English	3	Recently began using	0	Phone	6
Junior	5	Secondary education, Foreign Language	1			iPod	1
Senior	3	Secondary education, Math	1			Internet	4
		Secondary education, Science	1			Gaming console	1

What is considered technology in the classroom?		How many college classes have integrated technology?*		What is your source of technology training?		Is technology beneficial to teaching?	
Response	**#**	**Response**	**#**	**Response**	**#**	**Response**	**#**
Computers	6	None (0)	1	Mostly personal/informal use	9	Definitely yes	8
Projectors	2	Very few (1-3)	2	Some personal/informal use	1	Yes, when used correctly	2
Smart boards	4	Several (3-7)	0	Some formal training	7	Possibly not	0
Doc cams	2	Most (over 10)	7	Mostly formal training	0	Definitely not	0
PowerPoint	2						
Internet	1						
Calculators	1						
Phones	1						
Assistive devices	1						
Non-electronic devices	1						

the college she attended. She stated that she has been using computers and technology since elementary school. She uses computers, the Internet, and cell phones on a daily basis.

Participant 8 was a female early childhood education major with a concentration in deaf education. At the time of the interview, she was a junior at the college she attended. She stated that she has been using computers and technology since she was 5 years old. She uses computers and the Internet on a daily basis.

Participant 9 was a female secondary education biology major. At the time of the interview, she was a senior at the college she attended. She stated that she has been using computers and technology since elementary school. She mainly uses her cell phone on a daily basis.

Participant 10 was a female secondary education math major. At the time of the interview, she was a junior at the college she attended. She stated she has been using computers and technology for a long time, but did not explicitly state when she began using them. She mainly uses computers on a daily basis.

Findings

It should be noted that while creating the protocol for this study, the topic of PowerPoint presentation software was never used or emphasized. This study was based on the general overview of technology and technical communication used in an educational setting. While this was the case, discussion of PowerPoint software use was almost inevitable. In all preservice teacher interviews, participants brought up PowerPoint software use many times. Clive Thompson (2003) notes, "PowerPoint is the world's most popular tool for presenting information. There are 400 million copies in circulation, and almost no corporate decision takes place without it" (p. 88). Over a decade has passed since these statistics, and with the further development of technology, these usage numbers have likely grown.

Theme 1: Daily Use and Personal Experience

As current studies have shown, personal technology use in students has remained high. Smith and Caruso found in a 2010 survey of students and technology that around 98% of students currently own computers (Smith & Borreson-Caruso, 2010). A study conducted by Gemmill and Peterson (2006) found that college students use technology between 7.51 and 10.2 hours a day. These

data being accounted for, it is not a surprise that every student interviewed in this study stated that technology use was obviously a daily occurrence. Participant 2 stated:

> I use the computer almost every day, probably all day long whenever I'm not in class, I guess if cell phones are considered technology, smartphones, everything like, I use that all the time.

While this highlights the frequency of technology use of one of the students, every other student that was interviewed stated explicitly that they used their computer daily.

Most believe that preservice teacher training in technology is critical to their technical communication competency in the classroom. Studies have noted the extent of formal teacher education directed toward the subject of technology use (Russell, Bebell, O'Dwyer, & O'Connor, 2003; Yildirim, 2000). The attitudes of students during the interviews conducted in this study do not align with the view that formal technology education is imperative for proper preparation and use, but rather believe that regular use, not training in the classroom, is responsible for preservice teacher technology preparation. When asked about where students received their technology training, all of the answers showed similar responses.

> A lot of it came from my personal use and experiences, um, from growing up with my parents' computers and stuff like that going on. (participant 2)

> Most of it came from personal computer use just because of learning so early; you kind of just pick up things on your own. (participant 5)

> Pretty much learning how to, like, use the Internet and stuff, I had figured out on my own. Like, we did have classes, but I had figured it out before we were taught it. (participant 7)

This is consistent with other statements and findings, including a statement by the United States Department of Education, expressing that some individuals believe teachers develop their technological competencies while growing up surrounded by computers, and this will transcend into their teaching practices (Russell, Bebell, O'Dwyer, & O'Connor, 2003).

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Theme 2: PowerPoint Misuse and Proper Training

The ability to make concise, organized lists, graphics, and professional appearance are all elements of PowerPoint that cause it to be an enticing educational tool for current and preservice teachers. These features can keep the learner interested and stimulated, but the use of PowerPoint does not always create an overall positive outcome. Prior research notes the importance of using PowerPoint in a way that supplements a presentation. Craig and Amernic's (2006) view that poor presenters use PowerPoint as a metaphorical crutch is a significant idea based on this notion. It is emphasized that educators should be comfortable presenting without PowerPoint before using the software, as it could be relied on too heavily. These ideas should be noted for preservice and novice teachers, who do not yet have extensive experience in presenting information in front of a classroom.

An individual must initially be able to deliver a strong presentation alone to be able to integrate PowerPoint effectively into a presentation without falling to the wayside of the slides themselves. Davies, Lavin, and Korte (2008) described PowerPoint as "the new, intangible version of the podium which to hide behind" (p. 5). This concern was specifically addressed by Participant 9, who stated that "[teachers] need to learn to, like, engage their students with it and not have it as, like, a crutch, just have it as, like, a teaching tool for them." This present-speak-write model of teaching is similar to what Parker described in 2001. This was that instead of human contact, PowerPoint utilizes "human display," in which information is presented from person to person, rather than being discussed. If there is such a prominent instance of this type of teaching occurring, and also little evidence that teaching with PowerPoint increases academic performance, then why do educators continue to use PowerPoint so regularly that it was the top subject mentioned in this study?

The general opinion of the preservice teachers was that the effectiveness of technology in the classroom has to do with the amount of training that an individual has had in using technology for the education setting. The subjects expressed that they believe teachers use technology blindly, as to just use it without having a specific purpose, or they are being pressed to use new technology without being properly trained with it.

The opinions expressed by the participants who are being prepared to teach is that current preservice educators are improperly trained in using technology, and therefore it becomes no help to students, and sometimes a hindrance. It was also noted by the preservice teachers that there are few classes that formally train preservice teachers to integrate current and new technologies into the classroom. As noted in a study on teachers and technology integration by Judson in 2006, there is a gap between the beliefs and attitudes toward use, and the actual practice. Thirty-two primary and secondary classroom teachers were assessed about their beliefs of technology, which were generally positive. When their actual use of technology was measured, no significant correlations were found between positive attitudes and actual practice of technology (Judson, 2006).

Theme 3: Technology Reliance

One theme that was prominent throughout the interviews with preservice teachers was the general concern about the over reliance of technology. This is a somewhat surprising trend, as most of the beliefs of technology use in the preservice teachers were positive. Although all preservice teachers stated they would like to use technology in the classroom, the concept of overuse and over reliance was brought up as an issue by 6 out of 10 interviewees. This was the most common response when asked if there are any negative results to technology in the classroom. Some preservice teachers' attitudes aligned with the opinions noted earlier by Craig and Amernic, which stress that the teacher must be the primary educational force, and technology such as PowerPoint should only be a secondary supplement (Craig & Amernic, 2006). The way this is stated by preservice teachers is more as an issue that is currently happening or has happened to them, rather than a fear of this reliance happening in the future. Statements reflecting this include the following by Participants 4 and 3, respectively:

> Teachers should primarily be the largest part of the educational process, and technology should be used to supplement those teachers and not to replace them... I would hope that this would not become the predominant force of education but rather would just, you know, supplement or add to, um, one-on-one direct instruction that's already in place. (participant 4)

I think a lot of times teachers are relying too heavily on the technology and they're doing everything on the Smart Boards or doing everything on projectors and everything. And I think that they really need to remember that for some subjects, especially, I think, math, you need to kind of individually instruct each student with manipulatives and you still need those hands-on experiences in order for them to learn. You can't always rely on technology. (participant 3)

A final predominant attitude shared by several preservice teachers is that an overuse of technology may hinder the skills of both teachers and students in other academic areas. In the interviews, preservice teachers expressed their concern that an overreliance on technology may in turn cause a loss of proficiency in areas of schooling that may be thought as more traditional and less technological. Although the interview subjects generally did not respond with specifics about what would be hindered, all of the responses that expressed concern in this manner were similar. Selected themed responses concerning the loss of other skills due to technological reliance include the following:

Unfortunately, I think that there's a lot of online classes and things like that that are being taken, but I think that's where you lose a vital human element from your whole teaching experience and the learning experience. (participant 4)

Negative results would be the students being so hooked on the technology aspect... I don't want them to lose, like, the basics of, like, writings things and, like, figuring out problems. And just because there's technology, I don't want all the other stuff to go out the door. (participant 10)

It is promising that preservice students can realize that there may be a reliance on technology. The fact that it is known may cause active thought of less meaningless technology reliance in the classroom. Participant 6 voiced his concern about technology reliance in the classroom. Throughout the interview, Participant 6 made a fairly disheartening statement about the future of technology use with teachers, based on his knowledge of misuse and reliance, but also on the perpetuating trends of use by previous and current teachers. In responding to a question, he said, "I guess I've fallen into the trap, too..."

Conclusions and Future Directions

In an age where technology and technical communication is used on a daily basis and integrated into almost every aspect of life, classrooms are being exposed to new technologies very rapidly. A new wave of educators have become far more proficient in personal use of the newest technical communications. The issue is whether or not these future educators can integrate new technical communications into the classroom in an effective and meaningful way. In interviewing 10 preservice teachers, it was apparent that they believed they were fairly proficient in technology and technical communication use, and were eager to effectively integrate technologies into their future classrooms. When asked about the technologies they would use, they generally stated the technical communication tool, PowerPoint, as well as a few other technologies, and did not have a detailed plan for integration. The preservice teachers interviewed noted that their previous instructors had generally used a narrow range of technologies in the classroom, sometimes using these technologies in a way that did not help students in the learning and teaching integration process. PowerPoint was overwhelmingly the most prominent technology noted in the interviews, and the preservice teachers' attitudes were not positive toward this program as a form of technical communication in the classroom. We see this as a major shortfall in preservice teachers' technology preparation. There is a wide variety of technologies available to teachers including applications that could potentially enhance learning that the only real repetitive mention of technology was PowerPoint. When asked about classes which taught technology in education, the majority of participants noted that they do not have access to a wide variety of technology and technical communication integration courses. Further evidence is that nothing was stated by the participants about instruction on the integration of technology into the classroom setting. Future research should explore the variety of technology and technical communications courses available to preservice teachers and the successful implementation of technology based upon those courses. Specifically, how does one design an effective preservice teacher technology curriculum?

The attitudes of preservice teachers in this study do not align with the view that formal technology education is imperative for proper preparation and

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use, but rather believe that regular use, not training in the classroom, is responsible for preservice teacher technology preparation. It was discovered that preservice teacher participants learned how to use technology on their own and not in a formal classroom setting. Future research should explore how technology and technical communication education translates to technology use in the classroom. Does more formal technology instruction for preservice teachers enhance their ability to use and integrate technology into the classroom?

Simply using PowerPoint, or the latest technology available, in a classroom does not directly result in an effective and meaningful learning environment. This study, and others before it, provides evidence worthy of serious reflection on the reality that there is a significant issue in today's education system of the ineffective use of technical communication in educational settings. Technology and technical communication is being regarded as an important aspect of the future of education. Preservice teachers are exposed to some technologies and told that they will be integrating it into their classrooms. This will make these individuals eager to use this technology, but they have only been exposed to a narrow range of technologies, often used improperly. If preservice teachers experience their instructors using PowerPoint as the focal point of their lessons, they may be under the assumption that technology use generally means using PowerPoints as a lecture tool. Although the attitudes of these preservice teachers are aligned with effective use of technology in the classroom, they may not know how to actually implement the technology. If preservice teachers are not given the opportunity to effectively use technical communications in lessons, how will they have the skills to properly use it when they are teaching? More research needs to be conducted to ascertain if preservice teachers are capable of implementing technical communications in the classroom effectively. Educational technology for preservice teachers in higher education should focus equally on the proficient use of the technology and technical communication as well as the effective integration of it. If future educators are not being properly trained in this manner, they will have a hard time implementing technology in the classroom. Preservice teacher programs should not only address the proper integration of technologies into various educational settings but give preservice teachers opportunities to develop the skills necessary to properly integrate these technologies into the classroom setting so that students are not only engaged in the lesson but are retaining and learning the subject matter.

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Review of Four Books on Infographics

Brenda P. Huettner

Introduction

Infographics are popping up everywhere lately. They start with bite-sized chunks of information, organize them in a way that tells a story, and add just enough color to make the end result appealing to their audience. Sound familiar? A good infographic relies heavily on traditional technical communication skills. Unfortunately, many infographics do a poor job of communicating their messages. In response, many books are available on the market that attempt to guide you through the process of creating useful, attractive infographics.

One important distinction to make here: infographics are not the same as data visualizations. A "data visualization" is a specific chart, table, or other display based on a set of numbers. An "infographic" often includes one or more data visualizations (the "info" part), but will also include additional information such as illustrations, text blocks, photos, titles, and subtitles to tell a specific story. It generally has a conclusion or call-to-action. Some infographics do not even contain numeric data.

Infographics for Dummies
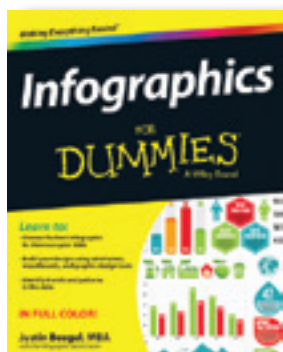
Author Justin Beegel and his Infographic World team create infographics for clients, and have included information about their process in *Infographics for Dummies*. It's a comprehensive book that starts with basics about infographic lifecycles and runs through the concept, design, creation, publication, and promotion of the finished piece. This book provides the information any team needs to create and publish an infographic. Beegel included chapters on how to use the most popular tools (Adobe's Illustrator and Photoshop) and brief discussions of online tools specifically for creating infographics. The focus tends to be from the agency perspective, with many references to client needs, approval processes, and branding requirements, but there's plenty here for individuals to learn.

As part of the Wiley "for Dummies" series, *Infographics for Dummies* highlights the practical tips and points to remember with larger, easy-to-scan icons. The reader can find great advice, real-world examples, and additional material available at the Dummies.com Web site.

Unfortunately, the examples don't always follow the book's advice. A graphic trying to show the benefit of adding context with color (p. 125) shows the data in varying shades of blue that are so similar it is difficult to distinguish between them. A great rule of thumb appears on page 120 about limiting the title to 5% to 10% of the overall graphic, but some of the book's samples (such as the ones on pages 139 and158) have titles that take up a quarter to a third of the whole piece. There was very little about accessibility concerns such as contrast levels, choosing colors that color-blind people can distinguish, or sizing type for readability.

Infographics for Dummies focuses on the infographic design elements and how to combine those elements into a cohesive whole. If you already know Photoshop or Illustrator, or know that you won't be using these tools, the hefty chapters devoted to the step-by-step graphic manipulation features of each won't be helpful. The sections on finding good data (chapter 5) and the list of places to find additional graphic inspiration online (p. 151) contain information that is useful in many contexts.

One interesting part of this book is the short two chapters that make up Part V: The Part of Tens. Chapter 14 is a list of ten current infographic trends to follow, such as the move toward tablets, increasing interactivity, and the use of infographics in multilingual environments. Chapter 15 talks about ten uses the team sees for infographics in the future. Though the topics in both chapters are treated at a superficially high level, together they make up an important list for moving forward in infographic design.

Infographics for Dummies is a terrific description of what made Infographic World so successful in

Four Books on Infographics

this space. It might be the inspiration for creating your own commercially successful, beautifully designed infographics.

The Wall Street Journal Guide to Information Graphics: The Dos and Don'ts of Presenting Data, Facts, and Figures
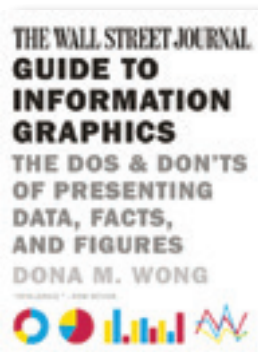
Dona Wong studied with Edward Tufte at Yale, spent nine years as the graphics director for the *Wall Street Journal*, and now shares her hard-earned knowledge with us in *The Wall Street Journal Guide to Information Graphics*. Wong takes her own advice to "simplify, simplify, simplify" and packs tons of information into a mere 158 pages.

This book emphasizes the data part about Information Graphics—that is, the visualization of data in graphic form, not necessarily the decorative, explanatory, or purely visual elements of an infographic. Like Tufte, she advocates against the inclusion of extraneous elements as distracting and ultimately detrimental to the point you are trying to make. As you might expect from the *Wall Street Journal*, the examples relate to business, investment, or general financial information. But it's all presented in such a clear, concise manner, with both good and bad examples of each tenet, that each section's point is crystal clear.

The chapters are arranged like a reference book, more of a style guide for good data graphics than a step-by-step tutorial. When the topic is bar charts, for example, we get guidelines on baselines, outliers, negative bars, and more. Chapter 3 goes into detail on the math behind some common data representations, and explains clearly how to choose an appropriate scale, how averages really work, and the pitfalls of working with percentages.

If you need to share numerical data in any way, infographic or not, you'll find yourself repeatedly referring to this book. If you create data visualizations or infographics now, or think you might in the future, *The Wall Street Journal Guide to Information Graphics* belongs on your reference shelf.

Cool Infographics: Effective Communication with Data Visualization and Design
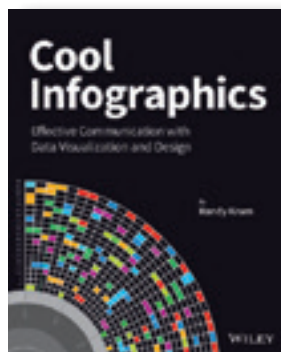
Randy Krum, like Justin Beegel, is president of his own infographic design firm, InfoNewt. He's also the creator of the Cool Infographics blog (www.coolinfographics.com), a site that gets more than 400 submissions per week of infographics that people think are cool. He clearly has a handle on what works and what doesn't, as well as a deep first-hand understanding about the current state of the infographic field.

In this book, *Cool Infographics: Effective Communication with Data Visualization and Design*, Krum steps through the process of creating a good infographic, with in-depth chapters on specific situations and a comprehensive list of online resources and tools for making your own infographics. The book itself is printed on high quality paper, with large margins, clear and crisp page design, and bright colors throughout. Each chapter is written so that it can stand alone, and each chapter's pages are color-coded so that it's easy to skip to a specific chapter. This formatting backs up his arguments for the importance of a beautiful design that keeps the needs of the audience in mind.

The first thing you'll notice about this book is the high percentage of sample infographics. They're generally bright, simple messages that convey data with a minimum of extraneous text. Though some are quite large (and thus look overly busy when reduced to fit onto the book's printed pages), Krum highlights relevant sections and emphasizes the salient points on each as they relate to the discussion at hand. The author uses some samples from his own company along with samples from other sources.

Though it covers in great detail the standard infographic creation process, the unique parts of *Cool Infographics* are the chapters that are devoted to unique situations, such as creating infographics for internal corporate use, for presentations, and for search engine optimization (SEO). The book includes a chapter (Chapter 4) on creating an infographic résumé that

includes dozens of examples in a staggering variety of formats. It is also that rare book that points out accessibility issues (including, for example, good and bad alt tag text strings for online distribution methods).

The chapter on Design Resources (Chapter 7) is comprehensive, covering a variety of tools, software, and data sources without overwhelming detail.

The only minor quibble I have is that the chapter with the most basic information about how to actually go about creating infographics is placed late in the book in Chapter 6, Designing Infographics. I'd much prefer this information before we get into the details of the specific infographic genres.

However, *Cool Infographics* overall is the strongest of those in this review, with an engaging style, many great examples, and enough information for anyone to get started with their own infographics, whether they have an agency behind them or not. Highly recommended!

Retro Review: The Visual Display of Quantitative Information
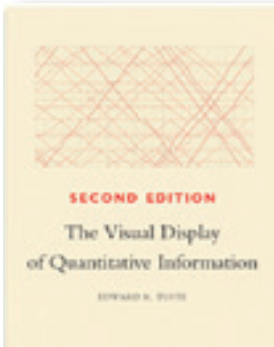
Long before we heard the term "infographic," Edward R. Tufte was teaching us how to create sharper, clearer data visualizations. *The Visual Display of Quantitative Information* has been in continuous publication since its first appearance from Tufte's own imprint, Graphics Press, in 1983, with a second edition released in 2011 containing full-color versions of many of the original graphics. In this landmark work, Tufte describes a set of guidelines for minimizing extraneous information ("chartjunk") and redundancy ("non-data ink") to communicate actual data in the most clear, concise possible way.

Tufte does this through extensive examples from throughout history. These images alone are worth a look through his book. For example, the classic graph of Napoleon's march through Russia was created in 1869 by French engineer Charles Joseph Minard, shows the size of the army, location on the map, time frame, and temperature. Tufte is also clearly a fan of William Playfair (1759–1823), and includes many of Playfair's works that helped define what we now know as bar charts and time-series graphs.

Tufte spends time talking about graphical integrity. It's all too easy to lie with a chart, and *The Visual Display of Quantitative Information* includes many instances of misleading graphics. For example, if you use two-dimensional shapes like a rectangle to show a series of data points, most people will assume the area of the shape represents the changing data point. But all too often, the graphic designer will change only one dimension (such as the height of each rectangle), thus skewing the perceived values. This effect is even more pronounced when using circles or complex shapes like little house icons to represent real estate values. In Tufte's world, accuracy is more important than any graphic, design, or decorative function.

The book also makes a strong case for removing any element from a chart that does not directly convey data. Tufte takes this to the extreme of sometimes recommending removal of grid lines, tick marks, and frame lines. Many of today's infographics go too far in the other direction, including elements and backgrounds just to support a theme or make things pretty. Perhaps a middle ground exists somewhere that's "just right."

As many others have pointed out, Tufte's obsession with minimalism does not carry over to his prose style. He has a flowery, wordy style, and isn't afraid to inject strong opinions into the discussion whether or not he includes objective backup for it.

Since the publication of *The Visual Display of Quantitative Information,* Tufte has written and published three other books on this topic. *Envisioning Information* (1990), *Visual Explanations: Images and Quantities, Evidence and Narrative* (1997), and *Beautiful Evidence* (2006). These books are all available from Tufte's own Graphics Press or through Amazon.com. But if you're really interested in the full Tufte experience, consider attending one of his full-day workshops. Tufte is still offering workshops as of this writing, and he gives out all four books to workshop attendees as part of the tuition. It is a real bargain if you get a chance to attend one.

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Beegel, Justin. 2014. *Infographics for Dummies*. Hoboken, NJ: John Wiley & Sons, Inc. [ISBN 978-1-118-729238-4. 306 pages, including index. US$29.99 (softcover).]

Four Books on Infographics

Krum, Randy. 2014. *Cool Infographics*. Indianapolis, IN: John Wiley & Sons, Inc. [ISBN 978-1-118-58230-5. 348 pages, including index. US$39.99 (softcover).]

Tufte, Edward R. 1983. *The Visual Display of Quantitative Information*. Cheshire, CT: Graphics Press. [ISBN 858-0001045689. 198 pages, including index. US$32.00.]

Wong, Dona M. 2013. *The Wall Street Journal Guide to Information Graphics: The Dos and Don'ts of Presenting Data, Facts, and Figures*. New York, NY: W.W. Norton & Company, Inc. [ISBN 978-0-393-34728-9. 158 pages, including index. US$24.95 (softcover).]

About the Author

Brenda Huettner is a technical writer based in Tucson, Arizona. She's an STC Fellow, an IEEE Senior member, and principal in P-N Designs, Inc, a technical communication consulting company.

Table 1: Books on Infographics

	Infographics for Dummies	Cool Infographics	The Wall Street Journal Guide to Information Graphics	The Visual Display of Quantitative Information
Audience	Beginner	Beginner to intermediate	Intermediate	Advanced
Major strengths	• Comprehensive • Highlighted tips and tricks • Includes examples • Step-by-step process for using Photoshop and Illustrator • Good list of resources	• Comprehensive • Beautiful graphics • In-depth discussion of types of infographics • Written in a modular fashion • Excellent list of resources	• Excellent reference guide • Many examples of good and bad data visualizations • Follows its own advice	• A classic in the field • Covers the history of graphics and data • Many examples (black-and-white in the first edition, more colors in the second)
Major weaknesses	• Some examples don't follow the book's advice • Only cursory discussion of tools other than Photoshop and Illustrator • Assumes a corporate environment	• Readers may not want to follow the chapters in the order presented	• Not a step-by-step procedure guide • Data visualization only (does not cover all infographics aspects)	• Not a step-by-step procedure guide • Data visualization only (does not cover all infographics aspects) • Somewhat dated • Wordy, academic style
Comments	Useful if you're starting out with an agency or creating infographics for your company. Good value.	Excellent value for the beginner or working practitioner, whether with a larger company or as an independent.	An excellent value as a reference work.	A foundational work that sets the stage for more modern books. Fair value.
Rating (5-star scale)	****	*****	****	***
Cost (USD)	$29.99	$39.99	$24.95	$30.00

Books Reviewed in This Issue

Supercommunicator: Explaining the Complicated so Anyone Can Understand

Frank J. Pietrucha. 2014. New York, NY: AMACOM. [ISBN 978-0-8144-3368-3. 258 pages, including index. US$17.95 (softcover).]

Technical communicators often must take technical content and make it understandable to non-technical people. An engineer may excel at engineering, but have problems explaining matters to accountants, marketing people, even the general public.

Pietrucha's *Supercommunicator: Explaining the Complicated so Anyone Can Understand* addresses this problem, not for technical communicators, but for engineers and other technical professionals. His main advice is to know your audience—something technical communicators have known all along. So, they are not the book's audience. Yet, the value for them comes in providing a source when asked about communicating to non-technical audiences.

Pietrucha divides the book into 9 parts with 31 chapters where he spends considerable time talking about visualizing the concepts to be communicated for a non-technical audience as though visuals would replace written explanations. He mentions several visualization tools, and PowerPoint receives considerable attention, both negative and positive. Pietrucha thinks that it can be a useful tool and disagrees somewhat with critics like Edward Tufte.

Supercommunicator is not a quick read because of its length and absence of examples. Readers will probably discover the same problems I found: Examples to support Pietrucha's assertions are not plentiful, nor are detailed annotations pointing out what is wrong with the sample and how to correct it. This lack is especially noticeable when he talks about slide design. Pietrucha does show sample slides from a talk on HIV/AIDS (pp. 210-214). And, this leads to an oddity in the book. He talks about simplifying visuals containing large amounts of data, yet the two examples he gives are far from simplified. Granted, it is difficult to construct a visual that shows all the trans-Atlantic flights on a given day (p. 203), but there must be a better way to visualize it for the intended audience. The same is true for a visual

comparing gross national product (GNP) and gold medals won at the 2004 Summer Olympics (p. 204).

Pietrucha does keep coming back to know your audience, yet the analysis approach he advocates is rather superficial and does not take into account, for example, the purpose the non-technical person brings to the communication.

While Pietrucha does increase the number of examples later in the book, he still looks at simplifying communication from a surface perspective. Adapting material to different audiences is more than changing the vocabulary. He needs to address such matters as, for example, sentence and paragraph structure.

For the price, *Supercommunicator* is worth recommending to technical people who want to communicate with people outside their field. You might caution potential readers that they will have to supply their own examples for the early part of the book, but that should not deter your recommending it nor their gaining from it.

Tom Warren

Tom Warren is an STC Fellow, Jay R. Gould Award for Excellence recipient, and professor emeritus of English (technical writing) at Oklahoma State University, where he established the BA, MA, and PhD technical writing programs. Past president of INTECOM, he serves as guest professor at the University of Paderborn, Germany.

The End of Print: The Grafik Design of David Carson

Lewis Blackwell. 2012. 2nd ed. New York, NY: Laurence King Publishing. [ISBN 978-85669-216-8.180 pages. US$45.00 (softcover).]

Twenty years after publication of *The End of Print*, does David Carson's iconoclastic, deconstructive, reconstructive, approach to graphic design still matter enough to support the publication of a revised edition?

In the early 1990s, Carson led a design

revolution in the visual language of type and image with his unexpected editorial designs for publications such as *Surfer, Beach Culture, Musician Magazine* and *RayGun Magazine* where he broke all the then accepted rules of graphic design, typography, and page layout. Many saw his work as a bridge between the long tradition of conventional print and the coming revolution in digital technology though he long assembled his final designs in analog form.

Carson's innovative, expressive designs often recall the pioneering typographic and photographic innovations of early Dadaists, Constructivists, and Futurists, the work of 1980s Dutch designers, Germans Gunter Rambow and Wolfgang Weingart, and Americans April Greiman, Jamie Odgers, Katherine McCoy, and Rudy VanderLans among many. Carson's work though provided the spark that fueled the expressive design renaissance of the 1990s and cemented the computer's use as the new tool in expanding the graphic design language.

Ken Wilson wrote in *Blueprint* magazine in 1995, "*The End of Print* was…to some degree a documentary record of a defining period for the profession as it moved abruptly and rather bewilderingly into the digital world." Carson's found imagery inspired design exploited visual puns, fragmentation, overlap, transparency, color shifts, and repetition. His designs were made with a disregard for conventional page grids, challenged conventional text reading, and pushed the legibility of messages to the edge. His treatment of the conventions of visual syntax was first opposed by many of the senior design establishment still committed to exhausted forms of modernism that would opt for more control or "… locked down rationalism…" in design as Tom Wyatt wrote in his own introduction to the second edition.

The second edition remains a traditional monograph with often insightful writing including new entries by contributors such as Jessica Helfand and Tom Wyatt. Carson's editorial designs, more recent advertising and TV commercial work, is interspersed with guest contributor's collages, and his own street photography that displays an iconic character and his cultural influences. Textures and rhythms in his photography of faded and peeling urban landscapes, billboards, and printing ephemera, as a major source of his visual language, reveal how seemingly random handling of type and white space stand out as image signs that shift attention to a profoundly visual way of reading messages.

Blackwell's analytical introduction summed up why Carson's work still matters today: "The duty of a graphic designer is to provide a visual experience that communicates the given content effectively." Tom Wyatt wrote, "…the rule dissolving, highly fluid forms of his work were made for the new digital designer to pick up and explore."

Carson's uniquely expressive approach remains controversial and quite significant as a means of visual expression in print and in transition from print to small screen.

Stephen Goldstein

Stephen Goldstein is an associate professor in the Communication Media Department at Fitchburg State University, a practicing graphic designer, a contributing writer to *Meggs' History of Graphic Design*, and an editorial committee member for the 5th ed. He is a guest lecturer and published author, writing in *Baseline Magazine, Novum, IdN*, and other publications.

Communicating Race, Ethnicity, and Identity in Technical Communication

Mariam F. Williams and Octavio Pimentel, Eds. 2014. Amityville, NY: Baywood Publishing Company, Inc. [ISBN: 978-0-89503-832-6. 184 pages, including index. US$54.95 (softcover).]

A vibrant mix of primary research and theoretical articles, *Communicating Race, Ethnicity, and Identity in Technical Communication* is a welcome collection that addresses critical issues in technical communication, especially for our globalized society.

The intercultural communication subject is not new to technical communication; however, one of this book's best features is that the articles are fresh and innovative. The main areas covered include historical representations of race and nationality in health and science communication, social justice and activism, social networking, reporting at historically Black colleges and universities, users' right to their own language, and communicating across borders and disciplines. The subject matter's timeliness is also a highlight where authors

address issues of race and ethnicity about contemporary technology, language, outsourced labor, and activism. Even historical representations of race and ethnicity have relevance to practicing technical communicators and graduate students. For instance, in the article "The Eugenics Agenda: Deliberative Rhetoric and Therapeutic Discourse of Hate," Richardson discusses a historical moment in North Carolina where extremely poor, "feebleminded," and "unfit" people were sterilized by the state. The deliberative rhetoric behind this movement is astounding and disturbing but not so far off from rhetoric associated with other social and political movements in contemporary society. Likewise, Pimentel and Gutierrez's chapter discusses negative racial rhetoric where they argue that the degrading rhetoric used to marginalize Mexican Americans is no longer associated with geographical regions or local populations. Since many commercials are uploaded onto YouTube and viewed around the world, the negative conceptions of Mexican Americans are seen, thus proliferated, worldwide.

Additionally, issues of language and identity are important cultural considerations in today's globalized workplace. In the chapter on Spanglish, Danuz presents clear arguments for the inclusion of Spanglish in technical communication as ways to achieve clarity and trust with increasing bilingual populations. Similarly, the chapter on Indian cultural identity as studied through Indian call centers is enlightening about how competence and trust are perceived through accents, as well as how new identities are constructed according to customer feedback and perceptions.

Communicating Race, Ethnicity, and Identity in Technical Communication has wide-reaching potential for readers and uses. Possible readers include scholars in technical communication and intercultural communication, practicing technical writers, and graduate students. Numerous possibilities exist for using this book in graduate courses, such as introduction to technical communication, intercultural rhetoric, proposal and grant writing, and courses that incorporate discussion about social justice.

Diane Martinez

Diane Martinez is an assistant professor of professional and technical communication at Western Carolina University. She previously worked as a technical writer in engineering, an online writing instructor, and an online writing center specialist. She has been with STC since 2005.

The Literary Theory Handbook
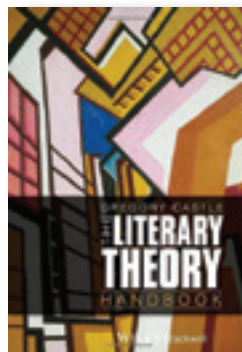
True confession: I love literary theory. I began my journey into this esoteric field in graduate school at George Mason University. It was there that I was introduced to an amazing universe of thoughts and ideas that borrowed from so many disciplines that I was interested in from psychology to linguistics to philosophy and more. The first book I studied was Derrida's *Of Grammatology*. As my professor at the time promised, my world would never be the same.

Gregory Castle's *The Literary Theory Handbook* is an excellent guide to navigate students through what I.A. Richards called a "chaos of critical theories" (p. 3). The book is well organized beginning with key definitions, moving into historical oversight, delving in scope and key figures, and concluding with short examples of theory in practice. Also included is a requisite bibliography and glossary. The result is something that transcends a mere map of a challenging landscape; it is a tool to lift students from theory and safely position them to enter the world of practice.

The two sections I enjoyed most and that provide the most value are section 2, "The Scope of Literary Theory" and section 3, "Key Figures in Literary Theory." I should also give a quick nod to the historical overview. While it is a fun read, it is inherently fraught with pitfalls. Quite simply, the history of literary theory is as chaotic as the field itself. Just setting it to pen welcomes debate.

To lay out the scope of literary theory, Castle neatly segments the field into six rubrics comprising major schools of thought and movements. He openly acknowledges that the rubrics are themselves theoretical as opposed to definitive and that with relative ease their borders could be redrawn. His point is to provide a framework by which to examine the chaos, knowing well it is just a snapshot of a fluid gestalt. Personally, it works for me.

The second framework Castle provides is by key players. This section's outline reads like a literary theory

hall of fame, ranging from the expected—Derrida, Barthes, Lacan—to the nuanced—Said, Baudrillard, hooks. Each entrant's information includes a brief biography followed by a selected bibliography. A person could argue that the list misses some notable figures—perhaps Chaim Perelman or Barbara Johnson—but it isn't meant to be a comprehensive list, only an overview. With that in mind, it succeeds.

Flaws? The theory in practice section seems thin, both in cumulative pages for the section as well as in word count for each entry. I expected each essay to be at least ten pages whereas they average three pages. The essays felt too abbreviated even for an introduction.

Altogether, *The Literary Theory Handbook* is an excellent introductory textbook. It is thorough enough to fully immerse students new to the subject and brief enough to serve as a "greatest hits" compilation for the more serious fan.

Gary Hernandez

Gary Hernandez is a communications director for an international oil company. He received his English literature MA from George Mason University and received his technical writing MS from Utah State University. Gary belongs to STC and IABC.

The Influential Project Manager: Winning Over Team Members and Stakeholders
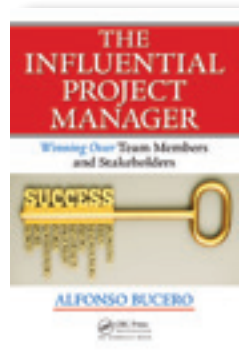
It's so much about trust. So says Alfonso Bucero in *The Influential Project Manager: Winning Over Team Members and Stakeholders* when it comes to being an effective project manager. As a Project Management Professional (PMP) and Project Management Institute (PMI) Fellow, Bucero speaks from experience with a career spanning more than three decades including work at Hewlett-Packard Spain and International Institute of Learning (IIL) Spain. He graduated from PMI's Leadership Institute Master Class 2007 Atlanta and received the PMI Distinguished Contribution Award in 2010. Bucero has been a keynote speaker for several congresses worldwide and teacher at several schools.

You should ask the right questions to achieve success in project management. Will I have the right team and right budget, plus have achievable goals and a supportive boss? Do I have the right skills? With a "Yes" answer to these questions, your chance of achieving success increases.

To be a successful project manager, you must also be a person of influence. In *The Influential Project Manager,* Bucero explains how to set and meet goals and fulfill the ambitions of your team, your stakeholders, and yourself. These are key parts to success.

Active listening and building partnerships loom as key components. Each chapter includes forms and tips on these topics involving how to influence others to support you and your ideas.

Getting back to the matter of trust and its importance to becoming an influential, effective project manager, a trust assessment appears in *The Influential Project Manager* to determine your level of influence. It also evaluates if others see you as trustworthy. "Without trust it becomes very hard to build alliances, commitment, and support from the firm. There is much more to being an effective influencer than trust, but lack of trust is a killer" (p. 165).

Informal alliances and integrity also appear as important components to the project manager's success. Concerning integrity, Bucero asks a few good questions (p. 174): "How well do I treat people from whom I gain nothing? Am I transparent with others?"

Optimism appears throughout *The Influential Project Manager* and especially at the end. "Get your ego out of the way and move on. You are a leader who needs to serve your people" (p. 179). That is fitting advice for the project manager.

Jeanette Evans

Jeanette Evans is an STC Associate Fellow and active in the NEO community, currently serving on the newsletter committee. She holds an MS in technical communication management from Mercer University. Jeanette has published in *Intercom* with articles ("What We Can Learn from Project Managers") and presented at various STC events.

Legal Aspects of Digital Preservation

Thomas Hoeren, Barbara Kolany-Raiser, Silviya Yankova, Martin Hecheltjen, and Konstantin Hobel. 2013. Northampton, MA: Edward Elgar. [ISBN 978-1-78254-665-8. 218 pages, including index. US$120.00.]
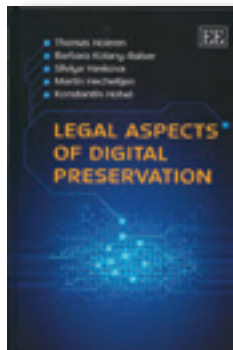
With increasing obligations to retain data, companies now rely more heavily on digital preservation. Comprehensive digital preservation systems protect data and ensure future accessibility. Along with this data retention, these systems must address the rights afforded various parties within the digital preservation chain to prevent infringing on protected rights. To create awareness of the complexity of legal issues in digital preservation within the European Union (EU), Hoeren, Kolany-Raiser, Yankova, Hecheltjen, and Hobel review primary EU and some Member State laws and regulations affecting digital data retention. *Legal Aspects of Digital Preservation* provides insightful guidance on possible legal implications related to transferring data (migration) and imitating systems (emulation). Technical communicators, whether assisting in the development of these systems or working with existing systems, should identify and document the rights and right holders at each stage of the digital preservation process.

Digital preservation systems must account for individual privacy rights. Because the EU Data Protection Directive protects sensitive data of identified or identifiable natural persons, companies cannot digitally preserve an individual's personal data without a statutory exception or the person's "clear and unambiguous" consent (p. 69). Because of the difficulty in obtaining consent and differing interpretations of consent between Member States, the authors advise businesses to anonymize personal data to protect individual identities. After locating personal information, technical communicators should remove identifying markers to ensure privacy.

Digital preservation systems must also address intellectual property rights. Under the EU Computer Program Directive and national copyright laws, copyright holders possess exclusive rights to reproduce and alter or adapt their protected material.

Thus, any data migration or porting may infringe on these rights. Because most EU Member States prohibit assignment or waiver of intellectual property rights, copyright holders license the use of their copyrighted material. Technical communicators should document both the scope and the duration of these license agreements. Although the EU Computer Program Directive provides some mandatory licensee rights, particularly the licensee's right to "use the computer program 'in accordance with its intended purpose'" (p. 129), some Member States prohibit porting and emulating data without a license. By identifying and documenting these intellectual property rights, technical communicators can assist in ensuring legal compliance by noting situations requiring additional authorization.

Although the material may be off-putting for the non-attorney, *Legal Aspects of Digital Preservation* demonstrates the importance of tracking rights in light of both EU regulations and applicable Member State laws. The authors make the text accessible to those outside the legal field by presenting complicated legal concepts in an understandable fashion. Clear definitions of legal terms and thorough explanations of existing laws and regulations assist the reader in comprehending a complex subject. Not only does this guide alert technical communicators to the information they should identify and document through the digital preservation process, the book makes a great desk reference for these legal concepts.

Valerie Mullaley
Valerie Mullaley is a contracts manager in Huntsville, AL. She holds a BS in Mathematics from the University of Alabama and a JD, cum laude, from Cumberland School of Law, Samford University. She is currently pursuing a master's degree in English at the University of Alabama in Huntsville.

The Next Digital Scholar: A Fresh Approach to the Common Core State Standards in Research and Writing

James P. Purdy and Randall McClure, Eds. 2014. Medford, NJ: Information Today, Inc. [ISBN 978-1-57387-495-3. 544 pages, including index. US$59.50 (hardcover).]

A current topic generating discussion among states, especially conservative states, is a government initiative on educational standards. Developed by a committee that, ironically, includes governors who now oppose such government standards, the Common Core State Standards (CCSS—2010; http//www.corestandards.org/read-the-standards/) set educational standards from K–12 that should lead to success not only in K–12, but also college and, later, a career.

The Next Digital Scholar: A Fresh Approach to the Common Core State Standards in Research and Writing, edited by James P. Purdy and Randall McClure, offers essays related to understanding the Standards, assignments that teachers can use to fulfill the Standards, and training needed by teachers in digital research and writing.

The perhaps unintended emphasis in the essays is on the tools that students can use to meet the CCSS. Yet, what is overlooked in these discussions is that students in 2014 are digitally literate and that traditional approaches are ineffective and boring. An example of the recognition of this digital literacy is that a new Navy ship uses game controllers and screens to run it. Other military branches recognize the digital capabilities of its members and are beginning to incorporate digital approaches to aspects such as weapons systems. The digital revolution (as aided and abated by parents providing the latest electronic gadgets) lets students play games, maintain social connections, find answers to questions, etc.

This brings us then to the question of how do you use digital technology to enhance and drive education? The current collection focuses on one issue: How can digital technologies enhance digital literacy? The consensus of the essays' authors is that the students' abilities to "read, research, and write digital text" (p. 26) needs additional enhancement to meet the CCSS standards.

These 17 essays followed by a Conclusion and Afterword are divided into five parts. In part one, two essays describe trends in technology use for writing, research, and reading. The second part, containing five essays, looks at CCSS as well as other academic standards and compares the CCSS with, for example, the standards developed in 1945 by The Association of School Librarians and The American Association of School Librarians. Another essay in this part discusses standards developed by the Writing Program Administrators organization. One essay describes a set of standards called Framework developed by the Writing Program Administrators, National Council of Teachers of English, and the National Writing Project as a response to CCSS. Part three focuses on assignments that teachers can use in connection with their schools' adopting CCSS and, through four essays, looks at such assignments as blogging, using Facebook and other social media, and budgeting for technology. Part four presents three essays that address curricular matters for teachers and administrators. The final and fifth part focuses on different approaches to teacher training, an important consideration so that the teachers are as well trained in digital literacy as the students. The Conclusion pulls together the key points that the collection makes, and the Afterword offers three challenges and three principles that are relevant to producing students who are digitally literate in their writing, reading, and research skills.

These essays provide information for teachers, administrators, and, I believe, citizens on what needs to be done and what digital skills students need for success in school and career. Each essay provides teachers with vital information on integrating digital research and writing into the classroom. But because the essays describe tools and their use, little if anything is said about analysis of the material students gather. For example, do students learn to evaluate whatever Wikipedia offers? Do the tools help students read critically?

A recent issue of *Time* magazine discusses the digital focus in the classroom. Some parents in some states, according to the article, object to CCSS on grounds that they, for example, can no longer help their children with homework. Other issues discussed include teacher preparation, high costs especially for maintenance, loss of some skills (cursive writing is the example given), and others.

Another problem, and perhaps a major one, is that books that deal with current issues are frequently months behind what the current situation is. Are these problems described in *Time* the problems that were current when the essays were written almost a year before publication?

So, what does this collection have to do with technical communication? First, technical communicators could become involved in developing the software documentation that helps students write and research digitally. Second, it is a valuable collection for those interested and involved in the debate over standards—and whose standards will apply—which would include technical communicators as parents.

Third, the essays will help those teaching technical communication at the high school and college levels. Therefore, I think this book is a welcome addition to a personal bookshelf, or at least a company or school library.

Tom Warren

Tom Warren is an STC Fellow, Jay R. Gould Award for Excellence recipient, and professor emeritus of English (technical writing) at Oklahoma State University, where he established the BA, MA, and PhD technical writing programs. Past president of INTECOM, he serves as guest professor at the University of Paderborn, Germany.

STATEMENT OF OWNERSHIP, MANAGEMENT, AND CIRCULATION

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There were 312 copies of TECHNICAL COMMUNICATION published in August 2014. The average for the preceding 12 months was 345. The paid/requested outside-county mail subscriptions for the August 2014 issue were 272; the average for the preceding 12 months was 305. Total distribution for August 2014 was 272. The average for the preceding 12 months was 305. Twenty free copies of TECHNICAL COMMUNICATION were distributed by mail in August 2014 and the average number of free copies distributed during the preceding 12 months was 20. Twenty copies of TECHNICAL COMMUNICATION were not distributed in August 2013, and the average number of copies not distributed during the preceding 12 months was 20. The percent paid/requested circulation in August 2014 was 93 percent; for the preceding 12 months, percent paid/requested circulation was 93 percent.

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The following articles on technical communication have appeared recently in other journals. The abstracts are prepared by volunteer journal monitors. If you would like to contribute, contact Lyn Gattis at LynGattis@ MissouriState.edu.

"Recent & Relevant" does not supply copies of cited articles. However, most publishers supply reprints, tear sheets, or copies at nominal cost. Lists of publishers' addresses, covering nearly all the articles we have cited, appear in *Ulrich's international periodicals directory*.

Collaboration

Rhetorical work in the age of content management: Implications for the field of technical communication

Andersen, R. (2014). *Journal of Business and Technical Communication, 28,* 115–157. doi: 10.1177/1050651913513904

"Drawing on a survey of the content management (CM) discourse, the author highlights CM trends and articulates best practices in content strategy that CM thought leaders are helping organizations adopt. These trends and practices are changing the nature and location of rhetorical work in organizations that produce intelligent content. In these contexts, rhetorical work is located primarily in the complex activity of building content strategy frameworks that govern text-making activities. The author highlights the need for a praxis-based collaborative model for technical communication education and research, and she offers some preliminary considerations for ways that the field might move in this direction."

Sean C. Herring

Communication

The role of communication complexity in adaptive contextualization

Katz, A., & Te'eni, D. (2014). *IEEE Transactions on Professional Communication, 57,* 98–112. doi: 10.1109/TPC.2014.2312454

"Adding contextual information to a core message has been shown to be critical in improving communication quality, especially in computer mediated communication. This paper models how people contextualize messages in the face of changing communication complexity. . . ." Following a pilot study, the authors "conducted a laboratory experiment, in which 258 participants working in pairs collaborated on a sixteen-step assembly task. They used a tailored system that structured each message as core (the essence of the message) and context (additional information that explains the core and the sender's perspective). [The authors] used unbalanced panel data analysis to examine the repeated measures of contextualization and communication complexity associated with each step of the task. . . ." Results suggest that "collaborators respond to changes in communication complexity at the expense of higher collaborative effort. . . . [The authors] offer a cost-benefit framework in which, at the step level, people contextualize to reduce the communication complexity, and at the task level, they additionally consider the impact of contextualization on task performance. The main limitation of this study was the need to structure the communication between collaborators, to control and measure contextualization. Future research can adapt and extend [the] measure of communication complexity to less structured communication."

Lyn Gattis

Design

Five design principles for writers and editors

Kristaponis, B. (2014). *AMWA Journal, 29,* 100–103.

Beginning with the rhetorical question, "If something is well-written, why does it need design help?" Kristaponis argues that writing itself, putting words on a "page" of any sort, is an act of design, successful or not. She provides a concise discussion of essential principles: C-WRAP (contrast, white space, repetition, alignment, and proximity). Helpful illustrations reinforce the message.

Magdalena Berry

Paying attention to accessibility when designing online courses in technical and professional communication

Oswal, S. K., & Meloncon, L. (2014). *Journal of Business and Technical Communication, 28,* 271–300. doi: 10.1177/1050651914524780

"Roughly 1 out of 10 students in our classrooms has some form of disability, and now that a growing number of technical and professional communication (TPC) courses and programs are offered online, scholars need to adequately address accessibility in online course design. Calling on the field to 'pay attention' to this issue, the authors report the results of a national survey of online writing instructors and use Selfe's landmark essay as a way to theoretically frame the results. They conclude by offering strategies for TPC instructors to design more accessible online courses."

Sean C. Herring

Editing

Training a novice to edit documents in the pharmaceutical industry

Horn, K. F., & Ennis, P. A. (2014). *AMWA Journal, 29,* 9–13.

Horn and Ennis consider editing to be a means of quality control for regulatory documents. Potential editors should have a degree in the biological or physical sciences, to assure familiarity with the organization and interpretation of data. Training consists of a series of editing tasks with increasing degrees of responsibility, and training materials are provided. The authors present a number of "editing rules" to new editors, for example, "Provide comments to the writer in complete sentences, which follow AMA style, and do not use personal pronouns."

Magdalena Berry

Education

Communication instruction in landscape architecture courses: A model and effects on students' self-efficacy

Housley Gaffney, A. L. (2014). *Journal of Business and Technical Communication, 28,* 158–186. doi: 10.1177/1050651913513903

"Communication skills are an increasingly important component of college students' education because these skills are in high demand from employers. This study provides a close examination of communication instruction in both a typical landscape architecture class and a modified one (i.e., with the addition of formalized communication instruction that is grounded in design), analyzing changes in students' perceptions of their own communication abilities (self-efficacy). The study reveals that in the typical class, students had a decrease in self-efficacy whereas in the modified class, students had a significant increase in self-efficacy. Viewing these results through the lens of self-efficacy and situated learning provides a complex understanding of the influences on students' experiences. For both teaching and research in communication across the curriculum, this study has implications about the importance of the nature of instruction."

Sean C. Herring

Engineering and narrative: Literary prerequisites as indirect communication for technical writing

Jeyaraj, J. (2014). *Journal of Technical Writing & Communication, 44,* 191–210. doi: 10.2190/TW.44.2.e

"While Engineering values direct communication, indirect communication produces a kind of literacy salient for engineers that direct communication may not offer in the way indirect communication does. This article emphasizes the inadequacies of overly emphasizing direct communication for Engineering majors and explains how teaching indirect communication in the form of literature has the potential to cover some of the inadequacies one can encounter if one were to overly emphasize direct communication."

Nick Carrington

New perspectives on the technical communication internship: Professionalism in the workplace

Bourelle, T. (2014). *Journal of Technical Writing & Communication, 44,* 171–189. doi: 10.2190/TW.44.2.d

"This article argues for developing linked courses in technical communication where the instructor facilitates a service-learning curriculum and then serves as faculty advisor within subsequent internships. In these linked courses, students write technical documents before moving into internships where they write similar documents. Specifically, the article examines the results from one such class and offers both theoretical and practical advice for collaborating with nonprofit and creating internships that are beneficial for both the students and the nonprofit. In addition, the discussion highlights students' preparedness to enter the field of technical communication, as evidenced through their internship work and their final reflections. Through careful consideration of the nonprofit responses, [the author] suggest[s] making changes to professional and technical communication curricula for linked courses and internships, including the addition of an objective of professionalism that teaches students to not only write in a professional manner, but to also consider their actions and responsibilities within the context of an organizational culture."

Nick Carrington

Ethical and legal issues

Strategies for writing about innovation: Navigating the relationship between technical documentation, patent prosecution, and technology transfer

Smith Diaz, C. (2014). *IEEE Transactions on Professional Communication, 57,* 113–122. doi: 10.1109/TPC.2014.2311874

"Technical writers rarely work on patent applications, but the typical documents writers prepare during research and development are important during patent disputes. Patent disputes are so costly that the potential for these disputes weighs heavily on the minds of those preparing patent applications. The relationship between technical documentation and the legal processes surrounding research and development need to shape a writer's documentation practice. . . . While impossible to know prior to a patent dispute how a document will affect the outcome of the dispute, technical communicators can adopt three strategies for preparing precise and complete documents. First, technical writers can adopt a 'liminal' practice—the ability to interact as needed with different disciplines. Second, technical communicators can approach new subjects with assent, a type of seeking understood in order to fully explore a new technology. And third, technical communicators can approach writing about research and development as a technical translation practice to translate highly scientific or technical language into precise plain language. By developing a liminal practice, technical communicators can build a robust documentation practice that includes the contextual nuances essential for work in patent prosecution and technology transfer."

Lyn Gattis

Information management

Cloud computing: A social relations perspective

Krogh, S. (2013). *Journal of Information Architecture, 5,* 21–30.

"Processing power, storage capacity and network bandwidth [in information technology] have increased exponentially, resulting in new possibilities and shifting IT paradigms. In step with technological changes, the paradigmatic pendulum has swung between increased centralization on one side and a focus on distributed computing that pushes IT power out to end users on the other. . . . So far, research in cloud computing has neglected [the social relations] perspective and focused entirely on aspects relating to technology, economy, security and legal questions. . . . [T]his paper points to the need for studying the social, relational and inter-organizational challenges associated with the widespread introduction of cloud computing. Based on previous studies in [IT outsourcing] and a review of existing articles on cloud computing, the purpose of this paper is to document a gap in the cloud computing research and identify relevant perspectives to be adopted in future studies of cloud computing."

Lyn Gattis

The practitioners of web information architecture in small and medium enterprises

Burford, S., & Given, L. M. (2013). *Journal of Information Architecture, 5,* 31–49.

"This paper reports an investigation of the practice of web information architecture (IA) in small and medium enterprises (SMEs). As information delivery via the web becomes a mainstream activity in all organizations, research and practical attention to Web IA remains focused on larger organizations and a new profession of information architect. The practice of web IA in SMEs has not been widely considered. This research collects the narratives of those who practice Web IA in the smaller enterprise and reveals that the dominant voice is that of a communication and marketing practitioner, rather than information professional. The outcomes of practice in this context suffer from a lack of knowledge and expertise."

Lyn Gattis

Instructions

Writing and assessing procedural rhetoric in student-produced video games

Colby, R. (2014). *Computers and Composition, 31,* 43–52. doi: 10.1016/j. compcom.2013.12.003

"Adding video games into a writing course opens up possibilities of more widely considering how multimodal texts communicate rhetorically, specifically how the rules and system of a game—its procedurality—offer an additional communication mode that engages a writer to more actively consider how a reader might interact with a work. Asking students to assess and inscribe procedural rhetorics by having them produce video games is a productive pedagogy that fosters positive habits of mind including curiosity, engagement, and creativity. Assessing these games should focus on how students write the procedurality of their games, both its potential and intention to transform. This article offers an introduction to procedural rhetoric and how it can be taught through student-produced video games. These games are then assessed not as products but through a student portfolio of shorter documents that demonstrate student learning through reflective practice involving metacognition, articulation of their own contributions and the contributions of their peers, formative and process assessment, and evaluations of their own and others' work."

Lyn Gattis

Intercultural communication

Geopolitics of grant writing: Discursive and stylistic features of nonprofit grant proposals in Nepal and the United States

Khadka, S. (2014). *Journal of Technical Writing & Communication, 44,* 141–170. doi: 10.2190/TW.44.2.c

"This study examines the global-local interplay of genre features in a select sample of nonprofit grant proposals from two particular sites—Nepal and the United States. Critically analyzing the carefully selected samples

from both the sites on their own terms first and then in clusters (of Nepalese and American proposals) by exploiting the genre and discourse analysis theories and techniques published in genre, genre analysis, and grant proposal scholarship, this study attempts to examine the genre of nonprofit grant proposal in both comparative and non-comparative terms. While the study acknowledges that each instance of nonprofit grant proposal is unique, complex, and therefore non-generalizable, it does draw some broad generalizations about the similarities and differences in the rhetorical 'moves,' organization, and/or composition strategies of grant writers from these two different geopolitical locations. The study finds that variations observed across samples and grant writers reflect the unique rhetorical situations of these writers, whereas uniformities have to do with the global circulation of Western genre forms in the rest of the world via global organizations like the United Nations and the International Monetary Fund—which are also the major donors in developing countries like Nepal. And finally, the study reaffirms the fact that constraints like funding agencies' guidelines and reviewers' preferences have a considerable influence on genre features and forms. That has been the case with both the Nepalese and American proposals sampled in this study."

Nick Carrington

Professional issues

Catechesis of technology: The short life of American technical catechism genre 1884–1926

Brockmann, R. (2014). *Journal of Technical Writing & Communication, 44,* 121–140. doi: 10.2190/TW.44.2.b

"Between 1884 and 1926, such publishers of technological information as Henley Publishing, Audel Publishing, John Wiley, Van Nostrand, McGraw-Hill, and Practical Publications put out dozens and dozens of technical catechisms on a wide variety of technical subjects. Then, around 1926, these publishers ceased releasing texts called catechisms. What made the genre so popular? Did it disappear? The answers

to these questions provide a case study of genre adaptation, genre change, and genre persistence within technical communication."

Nick Carrington

Our unstable artistry: Donald Schön's counterprofessional practice of problem setting

Cushman, J. (2014). *Journal of Business and Technical Communication, 28,* 327–351. doi: 10.1177/1050651914524778

Strategic planning, assessments, and continuous process improvements have become the norm at most post-secondary institutions. "This article considers how technical communication practitioners and teachers can approach Donald Schön's notion of problem setting as rhetorical and reflective work that offers us a richer, more precise language for articulating the technologies, narratives, and values from which problems appear as problems in the first place. The author posits that problem setting, when foregrounded in our work, adds value to the knowledge we make in practice rather than the knowledge we gain from stepping back and abstracting. After briefly describing problem setting as a significant yet invisible practice already underlying technical communication, he then describes a vignette from a digital marketing and design firm to foreground problem setting as creative, on-the-spot reflective work that we often use to invent, rather than discern, problems in unstable situations. The larger goal of this article is to further investigate Schön's past construction in order to examine how the practice of problem setting affects our ability to act within the instability of digital, divergent, and knowledge-intensive settings—the kinds of settings we regularly face in the workplace and the classroom."

Sean C. Herring

Public relations

Communication with stakeholders through corporate web sites: An exploratory study on the CEO messages of major corporations in greater China

In this digital age of technical communication, Ngai and Singh emphasize the relevance of audience focus and the influence of cultural diversity. "Drawing on an earlier study that views CEO communication as an important strategic tool, this study analyzes the content of CEO messages on Web sites of major corporations in Greater China to reveal their extratextual and intratextual characteristics. The study suggests that the language style employed in these messages, including the linguistic characteristics, regional themes, and interlingual themes, is associated with a corporate communication strategy that is underpinned by CEOs' beliefs and rooted in cultural values. The findings enhance our understanding of how CEOs view their stakeholders and the content that they include in their messages to stakeholders in order to compete in this digital age."

Sean C. Herring

The effects of different parts of the annual report on potential investors' attitudes towards the company and on the corporate reputation

"Both the function and the appearance of annual reports have changed over the last few decades. These multimodal reports now include many types of information that serve different functions. In this study, the effects of several information types on stakeholders' attitudes toward annual reports and the companies that published them are measured. . . . An experiment ($2 \times 2 \times 2$ between subjects design) was conducted to test the effects of a good financial review versus a poor one, a good future strategy versus a poor

one and a picture of the CEO smiling versus that with a serious facial expression. The effects on potential stakeholders' attitudes toward the information, on their attitudes toward investing in the company, and on their perceptions of the corporate reputation are measured. The results show significant effects of all three information types. A good financial review, a good future strategy, and a serious facial expression have beneficial effects on the potential stakeholders' attitudes and on the corporate reputation. More important, however, the results show that the information types should be aligned with each other. A smiling facial expression, for example, is only beneficial if the content of the other information types is good."

Lyn Gattis

Research

Exploring the back alleys of publishing qualitative organizational communication research

"As qualitative methods have gained a foothold in the academy over the past few decades, just what is publishable is perhaps the subject of debate between qualitative organizational communication researchers and the journal editors and reviewers they seek to impress. . . . As such, myriad rich conversations take place in the back alleys of journal publishing over the decisions made by the qualitative researcher and the requests made by reviewers. So, what are these conversations about? What are some of the lessons to be learned? Answering these questions is the subject of this essay, and [the author does] so by addressing three general topics persistently lurking in those journalistic back alleys as follows: (a) contributions to knowledge, (b) telling the story of qualitative data, and (c) methodological clarity. [The essay] conclude[s] with some final thoughts about what one can and cannot control in publishing qualitative data."

Lyn Gattis

Fieldwork horse-assery: Making the most of feeling humiliated, rebuffed, and offended during participant observation research

Tracy, S. J. (2014). *Management Communication Quarterly, 28,* 458–465. doi: 10.1177/0893318914536965

"Good field researchers must leave their ego at the door, be flexible, and learn to fit in. Furthermore, they should not only tolerate moments of humiliation and discomfort but also see them as opportunities for self-reflexivity, examination of tacit assumptions, and transformative resistance. . . . [I]n this essay, [the author] share[s] tales of fieldwork horse-assery, including embarrassing moments, being snubbed, and encountering objectionable talk and practices. Through reading these stories, field researchers may feel less alone, and people who are not field researchers might better understand the challenges of doing good fieldwork. Furthermore, these stories reveal how flashes of horse-assery can be remarkably insightful."

Lyn Gattis

Narrating the backstage of qualitative research in organizational communication: A synthesis [special issue]

Tracy, S. J. (ed.), Eger, E. K., Huffman, T. P., Redden, S. M., & Scarduzio, J. A. (2014). *Management Communication Quarterly, 28,* 422–431. doi: 10.1177/0893318914536964

"The five essays in this forum provide backstories about qualitative research in organizational communication. . . . Sharing the difficulties, foibles, uncertainties, tips, and tricks that make up 'backstage' qualitative research behavior can provide great pedagogical value and help [researchers] learn from others' experiences. Indeed, sharing these backstage moments—especially embarrassing or disheartening issues—provides social support as readers realize that other people, even senior or successful scholars, make mistakes and encounter challenges. Furthermore, vulnerably sharing backstage moments can encourage empathy from those who do not practice qualitative research and provide clarity about its challenges. In this introduction, [the authors] summarize the essays and offer questions to spur discussion and future research."

Lyn Gattis

Pathways to mindful qualitative organizational communication research

Brummans, B. H. J. M. (2014). *Management Communication Quarterly, 28,* 440–447. doi: 10.1177/0893318914535286

"[Q]ualitative researchers can gain valuable insights into the performative nature of organizations by cultivating awareness of the dynamic, interdependently arising nature of anything that appears to have a permanent, independent existence (including one's own self) during fieldwork." In this essay the author shares insights from fieldwork "[t]o illustrate how practicing mindfulness can deepen our understanding of an organization's enactment." The discussion includes "the importance of finding meaning in whatever happens in the field, and . . . the benefits of adopting a non-dualistic approach to studying how organizations are performed into being."

Lyn Gattis

Proposal pitfalls plaguing researchers: Can technical communicators make a difference?

Lemanski, S. (2014). *Journal of Technical Writing & Communication, 44,* 211–222. doi: 10.2190/TW.44.2.f

"The facts bear out that the odds are against most scientific researchers and scholars—especially those just starting out—in their attempts to win funding for their research projects through their grant proposals. In this article, the author takes a close look at some of the proposal-related problems and pitfalls that have historically challenged scholarly grant seekers. The intellectual prowess and specialized training of academics can sometimes be their downfall, when it comes to persuading government agencies and foundations to fund their well conceived, but unconvincingly presented projects. In examining numerous studies, surveys, and insightful articles of experts in the genre of the research grant proposal, it becomes evident that technical communicators could quickly become the best friends of scholars, when the former harness the rhetorical and stylistic skills that are almost instinctive to them, and apply them to writing grant proposals, a task which is all too often a disappointing exercise for the latter."

Nick Carrington

Social identity issues for qualitative and mixed methods scholars-mentors in a predominantly quantitative environment

Myers, K. K. (2014). *Management Communication Quarterly, 28,* 466–473. doi: 10.1177/0893318914536966

The author of this essay reflects on her experience "as a boundary spanner—one who conducts qualitative and mixed methods research in a department known for its quantitative work. Although the differences between qualitative and quantitative research are fundamentally epistemological, [her] focus is on how they often surface as differences between quantitative and qualitative researchers." The author describes how she has "evolved as a scholar who does not always fit the (methods) identity of [her] department," and she discusses ways she has introduced graduate students in the department to mixed and qualitative research methods. Her most important point is to examine "how students manage this tension as they develop into mixed methods scholars in a primarily quantitative program," as she "reach[es] out to others in similar situation[s], especially those who worry about how they and their students fit in."

Lyn Gattis

Unraveling the confessional tale: Passion and dispassion in fieldwork

Ganesh, S. (2014). *Management Communication Quarterly, 28,* 448–457. doi: 10.1177/0893318914535785

This essay considers the claim that, to be suitable for publication, communication research must "be presented in a considered, manifestly dispassionate, and quasi-realist tone. There are a host of robust warrants for this argument, including the need for methodological transparency and the need for qualitative research to be presented as rigorous, systematic, and valid." The author suggests, however, "that pressures to strike a dispassionate stance have elided the deeply constitutive role that personal and relational experiences play in the production of knowledge in the slew of methods that we loosely call 'qualitative.' In this essay, [the author] hope[s] to recenter the issue of researcher subjectivity and passion by drawing attention to the tension between realist and confessional modes of representation that animate the majority of academic writing practices populating the pages of our journals."

Lyn Gattis

Scientific and medical communication

Cracking the medical writer's genetic code

Van Nostran, W. (2014). *AMWA Journal, 29,* 112–117.

"By the mid-20th century, it became increasingly apparent that many scientists and medical researchers lacked sufficient English writing skills to communicate original research findings effectively—either to their peers or a wider audience. As the pace of technology and scientific discovery quickened, technical, medical, and scientific writing and publishing standards required specialized compositional competencies. As these scientific writing genres advanced, some technical and medical writers became disenchanted with the value of English writing instruction as taught within the humanities. To them, writing in the humanities fails to provide a suitable orientation for success as scientific and medical communicators. Drawing on authorities in the humanities, sciences, engineering, and medical writing, [the author] argue[s] that writing in the context of the humanities is equally pertinent to success as a professional medical writer. [The author] offer[s] several 'propositions' to challenge the claims of those who contend learning to write in the humanities is detrimental to a medical writer's career development [and] conclude[s] that fine writers and expert teachers of writing in the humanities possess the erudition and tools to make significant contributions to the medical writer's repertoire of relevant skills."

Magdalena Berry

The medical writer's survival kit

Madani, A. C. (2014). *AMWA Journal, 29,* 118–121.

This article provides useful writing resources identified by a practitioner. Madani divides her recommendations into "Textbooks," "Health News Sources," "Writing Guides," and "Resources Near You." She provides brief summaries and a list of AMWA resources.

Magdalena Berry

My little black book of texts for teaching medical writing

Arduser, L. (2014). *AMWA Journal, 29,* 56–60.

Arduser teaches a graduate-level course in scientific and medical writing. She offers a comprehensive list of sources useful in teaching students to develop skills in critical analysis as well as writing. Divided into "Critical Lens Resources" and "Writing Resources," the list ranges from work on the rhetoric of science to style guides such as the CSE Manual and Gastel's "Health Writer's Handbook." Succinct summaries accompany the texts.

Magdalena Berry

Pushing boundaries of normalcy: Employing critical disability studies in analyzing medical advocacy websites

Moeller, M. (2014). *Communication Design Quarterly, 2,* 52–80.

In recent years technical communication researchers have examined a variety of resources consulted by persons seeking medical information, such as hospital websites, medical clearinghouses, and government agencies. However, "[w]hile such analysis is indispensable to scholars interested in the dissemination and quality of medical information, narrowing the research in this manner inadvertently overlooks a host of burgeoning medical technical rhetoric on the Internet. One such location is online advocacy presence. . . . Such locations have traditionally been recognized as locations where advocacy organizations raise funds for research and support of patient and patient-adjacent populations." The article argues that websites of such advocacy organizations "function both as altruistic sites for promoting health and wellness for all while simultaneously extending harmful biopolitical logics that saturate this current historical moment (e.g., ableism, racism, heteronormativity)." The study calls for research with a "feminist disability studies lens [to] provide a way in which students can further deepen critical engagement with cultural texts—and thus recognize how they, and others, construct and are constructed by varying notions and in particular altruistic, web-based articulations of medical health and well-being."

Lyn Gattis

Usability and user experience

Knowledge work, knowledge play: A heuristic approach to communication design for hybrid spaces

McNely, B. J. (2014). *Communication Design Quarterly, 2,* 14–51.

"Everyday spaces and places are increasingly experienced as hybrid—as a confluence of material and informatics possibility—thanks to the ubiquity of always connected mobile devices and robust sociotechnical networks. For example, the interiors of many contemporary vehicles are personal area networks that move with drivers through daily commutes, connecting them to their phone's text messages and social networks in and through the material space of their car. In such cases, communication flows strongly mediate people's experiences in, movements through, and perceptions toward spaces of work, learning, and leisure. This article explores such hybrid spaces from the perspective of communication design, offering a heuristic approach to user experience in a world where spaces are often crosshatched and multiple. This exploration focuses on the kinds of tools and practices common to knowledge work and its recent extensions into forms of knowledge play, where the means of knowledge work are coordinated and transformed for non-work pursuits. This article, then, presents a practical, persona-driven perspective on the relationships between communication flows and hybrid spaces, challenging design of communication researchers and user experience professionals to rethink the everyday combinations of symbolic action, knowledge work tools and networks, and mundane locations and movements."

Lyn Gattis